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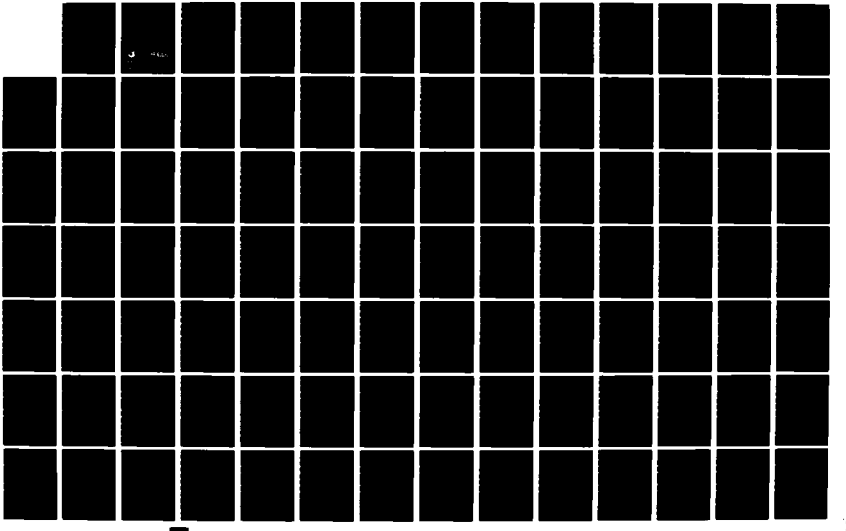

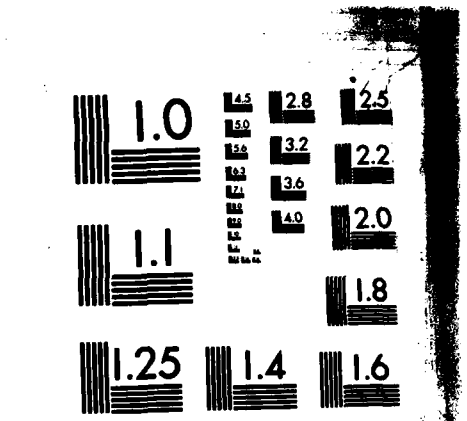

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FEASIBILITY STUDY FOR AN AIR FORCE ENVIRONMENTAL MODEL AND DATA EXCHANGE

Volume IV Appendix G: Model Review and Index-Air Multimedia and Other Models, Plus Data Bases

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JULY 1983

FINAL REPORT
MARCH 1981 - FEBRUARY 1983

AFESC

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The study assesses Air Force needs and capabilities for environmental consequence modeling, Air Force model application capabilities, and proposes resources available to overcome identified deficiencies. Needs for environmental information and analytical techniques were studied, and strategies proposed by which the modeling capabilities could evolve toward a comprehensive environmental information network, user community, and data exchange. The recommended information network would be known as the "Air Force Environmental Model and Data Exchange" (AFEMDEX). The technical report consists of four volumes. (continued)

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Volume 1: MODEL AND DATA REQUIREMENTS WITH RECOMMENDATIONS. The study recommends evolution of a computer-based network to enhance Air Force access and exchange of environmental information, and to match models with required data sources for effective application. The AFEMDEX network development is proposed in three evolutionary stages: (1) coordination; (2) information exchange; and (3) networking. Coordination would involve linking existing Air Force modeling needs to existing modeling resources in the Air Force and elsewhere, plus establishing a network of model support and use centers for operational modeling. Information exchange would involve developing techniques for transporting model data, analytical techniques and computer software from one model center to another, and promoting the distribution of coordinated hardware for a distributed network of model support centers. Network application involves the full linkage of distributed modeling computers into an integrated network. Other Air Force environmental information needs that could be addressed by AFEMDEX include: a hazardous chemical information system with chemical auditing, tracking, and disposal and accident planning; an improved environmental law information system; improved techniques for environmental data capture, storage, transportation, formatting, management and interpretation; computer cartography and site design aids; management information systems for facility planning, construction and operation; and a computer bibliographic reference database for environmental literature of special interest to the Air Force.

Volume 2: AIR FORCE NEEDS AND CAPABILITIES SURVEY. The survey instrument, survey results, and result analyses which constituted the Air Force needs and capabilities fact-finding task are presented. Air Force agencies which require, or desire environmental information or model application were surveyed to define operational needs and capabilities. Evaluation of present Air Force capabilities, plus capabilities of other federal agencies available to the Air Force, is discussed. A listing of existing environmental models which may be applicable to satisfying mission needs, with a preference rating, is presented.

Volume 3: MODEL REVIEW AND INDEX - WATER MODELS. A brief introduction to water models, by application category, precedes an extensive directory of water quality and quantity models. Reviews of models presented include (in general): (1) model name; (2) sponsor/developer; (3) contact; (4) model availability; (5) model abstract; (6) citation references; (7) current user; (8) implementation hardware/software; (9) input requirements; (10) output products; (11) synopsis of major parameters.

Volume 4: MODEL REVIEW AND INDEX - AIR, MULTIMEDIA AND OTHER MODELS, PLUS DATABASES. A brief introduction to air models, by application category, precedes an extensive directory of air quality models. The directory further provides reviews of multimedia, geology and soil, ecology, socioeconomic, exposure, noise, waste disposal, chemical spill, and traffic models. Further, a brief introduction to databases is followed by reviews for water, air, chemical and noise databases. Reviews of models presented include (in general): (1) model name; (2) sponsor/developer; (3) contact; (4) model availability; (5) model abstract; (6) citation references; (7) current user; (8) implementation hardware/software; (9) input requirements; (10) output products; (11) synopsis of major parameters.

PREFACE

This report was prepared by General Software Corporation, 8401 Corporate Drive, Landover, Maryland, 20785 under subcontract from M/A-COM Sigma Data Computing Corp., 5515 Security Lane, Rockville, Maryland 20852 under Contract No. WQ1Y03, Task 6, with HQ AFESC/RDV, Tyndall Air Force Base, Florida 32403.

This report documents work performed between March 1981 and February 1983. Dr. Carol Graves of Sigma Data Computing Corp., was the Project Officer for the IAG with the President's Council on Environmental Quality. Mr. John Ficke was the Project Officer for the IAG with the President's Council on Environmental Quality. Mr. Larry Milask was the Project Manager and Mr. Stewart McKenzie the primary author for the IAG with General Software Corporation. Captains George W. Schlossnagle, and Glenn E. Tapio were Project Officers for the Air Force Engineering and Services Center (AFESC/RDVS).

The authors wish to thank the Air Force personnel who participated in the questionnaire/survey and gave valuable comments and suggestions which enabled this feasibility study to accurately reflect the USAF capabilities and needs.

This report has been reviewed by the Public Affairs Office (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public, including foreign nationals.

This technical report has been reviewed and is approved for publication.

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SECTION I
AIR MODELS

1. TYPES OF AIR MODELS

This class of model covers the full range of complexity from simple analytical to numerical. Several categories and subgroups were established to permit discussion of capabilities within each category. In this way the range of models can be discussed in a logical fashion.

Air Model Category I contains models applicable to primary pollutants (i.e., pollutants emitted directly from the source) on a localized scale, typically less than 50 kilometers. The models are ordered into five groups under this category: Group 1 is models applied to open level terrain; Group 2 is models applied to urban level terrain; Group 3 models apply to hilly or mountainous terrain; Group 4 is transportation models (this includes highway and airport models); and Group 5 is comprehensive/multioption models. The Group 5 models include options for calculation of gravitational settling, deposition long-term and short-term pollutant concentrations and various source types.

Category II models can be applied on a regional scale (i.e., distances greater than 50 kilometers from the source).

Category III includes models which can simulate the effects of reactive pollutants emitted from sources. Results can be calculated on various temporal and spatial scales (up to regional for some models). This category of model is typically data-intensive and complex in modeling the chemical interactions.

Category IV is the Assessment Models. These models are used to assess air quality impacts and alternative pollution control strategies.

Category V is the special purpose models. The models can be applied to aerial spraying, problems where plume rise and downwash are important, and visibility problems due to particulates.

Category VI contains Rocket Firing Models.

Category VII Spills and Heavy Gas Models. These models simulate accidental releases of gas to the atmosphere and are applied to static and operational rocket firing to determine air quality concentration levels.

This classification of air models is summarized in Table H-1. Air quality models may be classified according to their methodology such as statistical, single box, Gaussian dispersion, multibox , and trajectory; or the models can be classified by their utility and areas of application. The following summary discusses the types shown in

TABLE H-1. TYPES OF AIR MODELS

Category		Group
I.	Primary Local	1. Open Level Terrain 2. Urban Level Terrain 3. Hilly Terrain 4. Traffic 5. Comprehensive
II.	Regional	
III.	Reactive	
IV.	Assessment	
V.	Special Purpose	
VI.	Rocket Firing	
VII.	Spills/Heavy Gas	

Table H-1 in order to describe general areas of application such as spatial scale or pollutant type. Additional groupings are listed within a general category to clearly distinguish, on a functional basis, the utility of each model. Complete model features, as well as basic assumptions, methodologies, and references for each air model are then listed.

It should be noted that many of the models could be listed in more than one category or group. The groupings in Category I closely follow those found in Atmospheric Dispersion Modeling; a Critical Design Review by D. Bruce Turner, APCA Journal, Vol 29, No. 5, May 1979.

a. Primary Local

Several groups of air models are in the general category of modeling primary pollutants on a localized scale.

(1) Open-Level Terrain. The first group of models (PTMAX, PTDIS, PTMTP, PTPLU, RAMR [the rural version of RAM], Turner's Workbook, and P23A-B) is applicable for continuous elevated releases over relatively open-level or country terrain. The four PT models are short-term point source models, whereas RAMR is applicable to point and area sources. PTPLU is an enhanced adaption of PTMAX which estimates maximum surface concentration at specified distances from a single source and PTMTP can handle multiple point sources. These five models are part of the UNAMAP (User's Network for Applied Modeling of Air Pollution) series. With the advent of PTPLU, PTMAX takes on a less recommended status. Turner's Workbook presents methods of practical application of the binormal continuous plume dispersion. Several special topics and example problems are given in the workbook. P23A-B is a model implemented on a programmable calculator that, not unlike PTDIS, estimates ground level concentration from a single point source at a given distance; but P23A-B has an urban/rural dispersion option and an option for time averages up to 24 hours.

(2) Urban-Level Terrain. The next group under the first category is appropriate for modeling urban areas with relatively level terrain. Models included in this group are: simple ATDL, CDM, CDMQC, AQDM, RAM, TCM2 and TEM8. The simple ATDL one-box model may be used as a screening model for entire urban areas. It is most suitable for averaging times of at least a few days. CDM and CDMQC are long-term models, monthly, seasonal, annual, applicable to point and area sources in urban areas. The CDMQC is CDM-altered to provide implementation of calibration, individual point and area source contributions, lists and averaging time transformations. This type of output is similar to that of AQDM. The AQDM has been greatly used in the past but is now less recommended than CDMQC. RAM is a short-term (hourly) algorithm used to estimate concentrations from urban point and area sources. TCM2 and TEM8 are relatively fast executing computer models for long-term and short-term concentration estimates,

respectively. These two models, as well as CDM/CDMQC and RAM, are EPA guideline models (1978) and are part of the UNAMAP series.

(3) Hilly Terrain. A third group of models (CRSTER, CRSTER2, MPTER, and VALLEY) is applicable to nonlevel terrain. CRSTER estimates the impact from a single plant where terrain features are 100 feet higher than the elevation of the lowest stack top for the plant. CRSTER2 and MPTER consider multiple sources and adjustment for the same type of terrain features. These models are valid for situations that would be considered rural, although the CRSTER models can account for urban and rural environments by adjusting dispersion coefficients and mixing height computations. CRSTER is often used to approximate maximum 24-hour concentrations that occur within a period of one year. VALLEY's primary use is for estimating the upper limits of 24-hour average pollutant concentrations due to isolated sources in rural, complex terrain. CRSTER and VALLEY are guideline models and are in the UNAMAP series along with MPTER.

(4) Traffic. A fourth group of models, applicable to transportation sources, includes HIWAY, HIWAY2, MODHIWAY, APRAC-1A, APRAC-2, PAL, AVAP and AQAM. HIWAY computes hourly concentration downwind of a single road segment. HIWAY2 is intended as an update to the highway model and MODHIWAY is HIWAY modified to allow for calculations for more than one roadway at a time. APRAC-1A computes hourly averages of carbon monoxide for entire urban areas primarily using an extensive traffic inventory of the area. APRAC-2 is a revised version of the APRAC-1A diffusion model that estimates ambient air concentrations for hydrocarbons, carbon monoxide or oxides of nitrogen. PAL is a point, area and line source algorithm that is applicable for road segments and may incorporate slant paths in the vertical and variable emission rates for calculation of aircraft take-off and approaches. AVAP evaluates air quality impact of airport and airport vicinity activity. AQAM, developed for the Air Force, estimates concentrations due to multipollutant emissions from point, area or line sources categorized by aircraft, airbase or environmental origin. AQAM has a long- and short-term model. HIWAY, HIWAY2, APRAC-1A and PAL are included in the UNAMAP series. HIWAY and APRAC-1A are EPA guideline models (1978).

(5) Comprehensive. ISC and ATM make up the last group of models in this category of modeling primary pollutants on a localized scale. They have the capability to estimate the effect of gravitational settling and dry deposition and are quite comprehensive with many features and options. ISC is used to evaluate the air quality impact of emissions from industrial source complexes for both short- and long-term analyses. ATM is a long-term model used for calculating values for atmospheric concentration as well as both wetfall and dryfall deposition rates. The ISC short-term and long-term models are included in the UNAMAP series.

(6) Spills/Heavy Gas The Ocean Breeze-Dry Gulch-and Mountain Iron-Diffusion equations are used to predict downwind concentrations of toxic materials. Various evaporation rates are used in the basic equations in the event of hypergolic rocket propellant spills. These models are operationally simple statistical diffusion prediction equations based on experimental field tests conducted in the 1960s.

Over the past decade or so numerous complex models applicable for negatively buoyant heavy gas clouds formed by accidental spills of volatile liquids have been proposed. These models exhibit a range of complexity due to their physical completeness and methodologies and many remain under development. Review papers, Shinn et al, (1981), Woodward et al, (1981) and Havens (1980) suggest the necessity of continued evaluation of these models with existing and new field data.

CHRIS, the Chemical Hazards Response Information System, has been developed for the U.S. Coast Guard to provide information during emergencies involving the accidental release to air or water of hazardous chemicals. The system consists of four manuals, a regional contingency plan, a hazard assessment computer system (HACS) and an organizational entity located at Coast Guard headquarters. The four manuals include: 1) A Condensed Guide to Chemical Hazards, 2) Hazardous Chemical Data, 3) Hazard Assessment Handbook and 4) Response Methods Handbook.

A brief description of each component of CHRIS is provided below.

The Condensed Guide to Chemical Hazards manual contains information to facilitate "early response decisions" during emergency situations. It is a compact, convenient source of commercially transported hazardous materials. The guide contains precautionary and biological hazards so that field personnel can assess the threat as a prerequisite to determining subsequent large-scale action.

The Hazardous Chemical Data manual contains detailed, largely quantitative, chemical, physical, and biological data necessary for formulating, evaluating, and carrying out response plans. It also contains the hazard assessment code, which is essential to selecting the appropriate calculation procedures for the hazard assessment, and lists the needed physical and chemical property data which are required to perform the hazard assessment calculations.

The Hazard Assessment Handbook contains methods of estimating the rate and quantity of hazardous chemicals that may be released under different situations. It also provides the means of predicting the threat that the chemicals present after release. It includes methods for predicting the resulting potential toxic, fire, and explosion effects by providing procedures for estimating the concentrations of

hazardous chemicals (both in water and in air) as a function of time and distance from the spill.

The Response Methods Handbook is a compendium of descriptive information and technical data pertaining to methods of responding to threatened or actual spills of hazardous chemicals. It has been written specifically for Coast Guard on-scene coordinators who have had some training or experience in pollutant and hazard response.

The Database for Regional Contingency Plans provides detailed information on regional or local resources that might be threatened and the availability of response equipment. It contains information such as an inventory of physical resources and personnel, vulnerable or exposed resources, potential pollutant sources, geographical and environmental features and cooperating organizations.

HACS, the Hazard Assessment Computer System is the computerized counterpart of the Hazardous Chemical Data Manual and Hazard Assessment Handbook. It is designed for use by trained Coast Guard headquarters specialists to obtain very detailed hazard evaluations quickly, when requested by on-scene coordinators.

HACS, consists of a number of models which simulate phenomena such as liquid spread and fire, dispersion of vapor, radiation from fires, and dissolution and dispersion in water for a variety of chemicals. The rationale was to group the chemicals according to certain physical and chemical characteristics. A hazard assessment tree was formulated, the branches of which represent various physical processes that different chemicals undergo, such as evaporation, sinking and dissolution, etc. The branching or selection of a path is determined by ambient conditions, and physical phenomena which may occur are identified by one- or two-letter hazard assessment codes, most of which also refer to an appropriate model. These models were designed for use with any chemical within a particular group exhibiting similar behavior. Thus, given the chemical spill, its properties and assessment codes, potential hazards are assessed by exercising each of the physical models along the indicated path or paths.

SIGMET, by Science Applications, Incorporated, uses finite-difference equations describing conservation of mass, momentum and energy to predict the spreading, evaporation and eventual dispersion of LNG from accidental spills. The modeling techniques are not specific to LNG vapor dispersion of other gases added to the atmospheric boundary layer. Havens (1980), in his assessment of several models, believes that such techniques of SIGMET hold the most promise for accurate prediction of catastrophic (25,000 m^3 of LNG onto water) spill behavior.

ZEPHYR of Energy Resources Co. and MARIAH of Deyon-RA are similar to SIGMET in that the same set of equations are used but significantly different numerical solution methods are used. These two models were compared with three uniform concentration cloud type models (Germeles and Drake, Eidsuik, and HEGADAS) for much smaller spill sizes over both land and water (Woodward et al., 1981). In general, ZEPHYR and MARIAH matched experimental data better than the other three models with Eidsuik, and HEGADAS better than Germeles and Drake; but different models are applicable over different ranges of conditions.

Lawrence Livermore National Laboratory has been involved in heavy gas dispersion research, both with field testing and model development (Shinn et al., 1981). SLAB predicts cloud features as a function of position and time of cold or heavy gas and other relevant quantities due to gravity flow and dispersion following a spill of liquefied gas under arbitrary atmospheric conditions. The cloud features include concentration, height, width, temperature and motion. FEM3 is a model under development based on the three-dimensional conservation equations of mass, momentum, energy and species that have been used for simulating LNG vapor dispersion in the atmosphere.

b. Regional

Included in the category of regional scale models are RCD, REGMOD and ARL-ATAD. RCDM predicts long-term (e.g., monthly or yearly) concentrations from single or multiple point and area sources at distances greater than 50 km. It is designed for a coupled set of pollutants by a mechanism which is either slow and irreversible (e.g., SO_2/SO_4) or fast and reversible (e.g., NO/NO_2). REGMOD is designed to predict short-term air quality impacts from multiple source inventories for the same type of coupled pollutants. Both of these models include wet and dry deposition of both species. ARL-ATAD is intended primarily for use in calculating transport, diffusion and deposition of effluents on regional and continental scales.

c. Reactive Pollutants

LIRAQ, SAIASP, PBM, LPAQSM, OZIPP and RPM-II fall under the general category of modeling reactive pollutants. The first four models are undergoing evaluation and verification as part of the EPA Regional Air Pollution Study (RAPS) model validation program. LIRAQ exists in two versions, both of which are designed to predict regional distribution (1 to 100 km) of air pollutants. LIRAQ-1 treats up to four noninteracting or simple interacting species and LIRAQ-2 simulates evolution of the concentration of 12 chemically interacting species. SAIASP also estimates the evolution of concentration of urban atmospheric smog-related pollutants, including ozone. SAIASP and LIRAQ are rather input data-intensive grid-type air quality simulation models (AQAMS). The PBM is a simpler stationary single-cell photochemical AQSM. It provides hour-averaged measures of air

quality. Spatial resolution is not possible within the dimensions of the cell (on the order of 20-30 km). LPAQSM follows a parcel of air, typically 5 x 5 km by 1.5 km high, to model emissions, transport and transformation of species in the presence of ultraviolet radiation between sunrise and sunset on a single day. The major function of OZIPP is to generate an ozone isopleth diagram representative of a particular city. The diagram explicitly depicts maximum, 1-hour average concentration of ozone occurring within or downwind of a city as a function of precursor levels existing within the city in the early morning. RPM-II provides a time history of pollutant concentrations within a chemically reactive point source plume. ROLLBACK and AVGTIME are included in an assessment category. ROLLBACK is an AQSM that has been used for assessing the relative air quality impacts of alternative control strategies. It can be used to estimate changes in carbon monoxide and annual average nitrogen dioxide levels due to assumed changes in CO and NO_x emissions, respectively. AVGTIME uses either measured or dispersion modeled air quality data for one averaging time to calculate percentiles and expected maxima for other averaging times for which air quality standards have been written.

d. Special Purpose

The next category contains three special-purpose models: BLP, Aerial Spray Assessment Model (ASAM), and PLUVUE. BLP is a dispersion model designed to handle unique modeling problems associated with aluminum reduction plants and other industrial sources where plume rise and downwash effects from stationary sources are important. ASAM is a line source model that calculates centerline concentration perpendicular to the aerial spray line. It assists spray personnel to determine the best spray altitude for certain wind conditions, target, and off-target concentrations. PLUVUE calculates visual range reduction and atmospheric discoloration caused by plumes consisting of primary particulates, nitrogen oxides, and sulfur oxides emitted by a single emissions source.

e. Rocket Firing

The ADOBE EQUATIONS, MODIFIED CRAMMER-GAUSSIAN EQUATIONS and the REED models are included in a category applicable for rocket firings. The ADOBE and MODIFIED CRAMER-GAUSSIAN equations are site-specific to AFRPL. ADOBE is used for small (< 4000 pounds) horizontal rocket motor firings. The model is best for quasi-instantaneous hot horizontal releases, but may be used for longer or cooler releases with some confidence. Modified Cramer-Gaussian is used for larger (2-44 tons) vertically fired static rocket motor firings. The REED Meteorological, Cloud Rise (source) and Multilayer Diffusion Models are designed to generate a mapping for the air quality concentration levels of the exhausted constituents from launch operations. Options

for precipitation scavenging, gravitational settling and surface absorption of a constituent afford the potential for studying the Earth quality.

f. Summary of Air Models by Types

TABLE H-2. MODELS BY CATEGORY

CATEGORY I PRIMARY POLLUTANTS ON A LOCALIZED SCALE

Group 1 Level Open-Country Terrain

PTMAX
PTDIS
PTMTP
PTPLU
RAMR
TURNER'S WORKBOOK
P23A-B

Group 2 Urban-Level Terrain

SIMPLE ATDL
CDM
CDMQC
AQDM
RAM
TCM2
TEM8

Group 3 Nonlevel Terrain

CRSTER
CRSTER2
MPTER
VALLEY

Group 4 Transportation

HIWAY
HIWAY2
MODHIWAY
APRAC-1A
APRAC-2
PAL
AVAP
AQAM

Group 5 Comprehensive/Multioption

ISC
ATM

CATEGORY II REGIONAL SCALE

RCDM
REGMOD
ARL-ATAD

CATEGORY III REACTIVE POLLUTANTS

LIRAQ
SAIASP
PBM
LPQSM
OZIPP
RPM-II

CATEGORY IV ASSESSMENT

ROLLBACK
AVGTIME

CATEGORY V SPECIAL PURPOSE

BLP
ASAAM
PLUVUE

CATEGORY VI ROCKET FIRINGS

ADOBE
MODIFIED CRAMER-GAUSSIAN
REED

CATEGORY VII

SIGMET
SLAB

REFERENCES FOR TYPES OF AIR MODELS

HAVENS, J.A. "An Assessment of Predictability of LNG Vapor Dispersion From Catastrophic Spill Onto Water." Journal of Hazardous Material, 3, 267-278, 1980.

SHINN, J.H.; ERMAK,D.L., and KOOPMAN, R.P. Heavy Gas Releases: Recent Dispersion Research. Presented at the Workshop on the Parameterization of Mixed Layer Diffusion, U.S. Army Research Office, Las Cruces, New Mexico, to be published in the workshop monograph, October 20-23; 1981.

WOODWARD, J.L., HAVENS, J.A., MCBRIDE, W.C., TAFT, J.R., A Comparison with Experimental Data of Several Dispersion of Heavy Vapor Clouds. Preprints for NATO 12th International Technical Meeting on Air Pollution Modeling and Its Application, Menlo Park, California, 1981.

2. ALPHABETICAL LISTING OF AIR MODELS

(a) Index of Air Models

(1)

Model acronym:	ADOBE EQUATIONS
Model name:	Atmospheric Diffusion of Beryllium Equations
Sponsor:	Air Force Rocket Propulsion Laboratory, Air Force Systems Command, Edwards Air Force Base, California
Developer:	Edwards Air Force Base, California
Type of model:	Air

Abstract:

The ADOBE equation is used for small (less than 4000 pounds), horizontal rocket motor firings. The model is best for quasi-instantaneous hot horizontal releases but may be used for larger or cooler releases with some confidence. The equations used at AFRPL yield solutions at the 95% confidence level.

Document citations:	AFRPL-TR-70-65. Vol. I, II, III
Principal users:	AF - AF Rocket Propulsion Laboratory, Edwards AFB

Assumptions:

The equations were developed using a regression analysis on data obtained at AFRPL from horizontal static test firing and are site-specific. Not applicable to buoyant vertical releases,and solutions may not be dependable for distances less than 2000 feet or greater than 40,000 feet.

Implementation level:	This is a set of equations that could be implemented on anything.
Current hardware:	IBM 1800
Input requirements:	Mean horizontal wind speed, horizontal wind direction variance, temperature deviation Sfc-54 ft and any two of the following; exposure, distance,amount released.
Output format:	When two of the three variables above are entered, the equation will solve for the third variable.
User manual:	Yes
Date of latest documents:	1971
Learning difficulty:	Low
Geographic area:	Developed on data obtained at AFRPL
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes

Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Complex topography:	No
Simply topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introduction:	No
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	No
Time scale: Years	No
Temperature deviation and horizontal wind direction variance:	Yes

(2)

Model name:	**Aerial Spray Assessment Model**
Type of model:	Air

Abstract:

The Aerial Spray Assessment Model is a line source model that calculates centerline concentrations perpendicular to the spray line. The model is run prior to aerial spray operations and assists the spray personnel to determine the best spray altitude for certain wind conditions, target and off-target concentrations.

Document citations:	USAF Environmental Technical Application Center, USAFETAC Report 7920.
Principal users:	Air Force, Scott AFB
Output format:	Centerline concentrations
Analytical features for Model:	Air Quality
Linear sources:	Yes

(3)

Model acronym:	AIRTEST
Model name:	AIRTEST
Sponsor:	Teknekron Research, Inc.
Developer:	Same as above
Contact:	Dr. Andrew Van Horn
Contact address:	Teknekron Research, Inc., 2118 Milvia Street, Berkeley, CA 94704
Contact telephone:	(415) 548-4100
Type of model:	Cost-benefit

Abstract:

The Air Test Model is a preprocessor to the Utility Simulation Model, which can also be used as a stand-alone model. Using actual fuel and specified generation for each power plant or generating unit, it calculates for 1 year the controlled and uncontrolled emission of SO_2, NOx, and particulates. In addition, the model selects the least-levelized cost fuel and pollution control option to meet unit specific emissions standards.

Functional Capabilities: The options to meet the applicable SO_2, NOx, and particulate standards currently include: actual 1979 for fuels burned in the generating unit, coal washing on a coal specific basis, low sulfur coal options for each unit, coal blending to meet unit specific standards, wet and dry FDG, ESPs, fabric filters, low excess air, staged combustion, flue gas recirculation, limestone injection burners and oil hydrodesulfurization. The Air Test Model passes each unit's low cost and fuel characteristics on to the Utility Simulation Model.

Document Citations:

REFERENCES: Carol Bowan, Don Clements, Michael Moffet, Andy Van Horn. AIRTEST User's Guide. Nov. 1980.

Teknekron Report No. (RM-060-DOE-80)

Principal users:	AIRTEST is currently being used in the Acid Rain Mitigation Strategies research program.
Assumptions:	Assumes minimization of levelized cost of fuel and pollution control vs. the decision factor in selection of fuel and technology.
Current hardware:	CDC 7600, IBM
Current implementation:	Mainframe computer
Software language(s):	FORTRAN
Word size(s):	60-bit, 32-bit
Input requirements:	Actual fuel and specific generation for each power plant or generating unit to be considered.
Output format:	Controlled and uncontrolled emissions to SOx, NOx, and particulates, pollution control option and cost and fuel type and cost for each unit.

Load module storage:	Disc storage - 200 tracks
User manual:	Yes
Systems documentation:	Yes

(4)

Model acronym:	APRAC-1A
Model name:	Air Pollution Research Advisory Committee-Model 1A
Sponsor:	Environmental Protection Agency and coordinating Research Council
Developer:	Stanford Research Institute
Contact:	D. Bruce Turner
Contact address:	EPA Environmental Sciences Research Lab, Mail Drop 80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	The source program for this dispersion model is available as part of UNAMAP (Version 4), Accession Number PB 81 164 600, for $840 from Computer Products, NTIS, Springfield, VA 22161
Type of model:	Air
Summary:	Computes hourly averages of carbon monoxide for urban locations.

Abstract:

Stanford Research Institute's urban carbon monoxide model. Computes hourly averages for any urban location. Requires an extensive traffic inventory for the city of interest. The APRAC-1A diffusion model was developed as a versatile and practical model for computing the concentrations of pollutants at any point within a city. The model calculates pollutant contributions from diffusion on various scales, including: extraurban diffusion, mainly from sources in upwind cities; intraurban diffusion from freeway, arterial, and feeder street sources; local diffusion of emissions within a street canyon. The model treats only carbon monoxide (c), a relatively inert gas in the atmosphere but an important pollutant in terms of health. Motor vehicles are the major source of this gas.

Document citations:

User's Manual for the APRAC-1A Urban Diffusion Model Computer Program, PB 213 091, NTIS, Springfield, VA 22161.

Practical Multipurpose Urban Diffusion Model for Carbon Monoxide, PB 196 003, NTIS.

Field Study for Initial Evaluation of an Urban Diffusion Model for Carbon Monoxide, PB 203 469, NTIS.

Evaluation of the APRAC-1A Urban Diffusion Model for Carbon Monoxide, PB 210 813, NTIS.

Dabbert, W.F.; Ludwig, F.L.; and Johnson, W.B., Jr. "Validation and Applications of an Urban Diffusion Model of Vehicular Pollutants," Atmospheric Environment, 7, 603-618, 1973.

Johnson, W.B.; Ludwig, F.L; Dabbert, W.F.; and Allan, R.J. "An Urban Diffusion Simulation Model for Carbon Monoxide," Journal of the Air Pollution Control Association, 23 (6), 490-498, 1973.

A source program available as part of UNAMAP, (Version 4), $840, PB 81 164 600, NTIS, Springfield, VA 22161.

Validation: Reviewed and approved by OAQPS

Assumptions:

A. Source-Receptor Relationship. The user specifies the set of traffic links (line sources) by providing link endpoints, road type and daily traffic volume. The traffic links may have arbitrary length and orientation. Off-link traffic is allocated to a 2 x 2 mi. grid. Link traffic emissions are aggregated into a receptor-oriented area source array. The boundaries of the area sources actually treated are (1) arcs at radial distances from the receptor which increase in geometric progression; (2) the sides of a 22.5-degree sector oriented upwind for distances greater than 1000 m. A similar area source array is established for each receptor. Sources are assumed to be at ground level, and up to 10 receptors are allowed in the model. Receptors are at ground level and their locations can be arbitrary. Four internally defined receptor locations on each user-designated street are used in a special street canyon submodel.

B. Emission Rate. Daily traffic volume for each link and off-link grid square is input and modified by various factors to produce hour-by-hour emissions from each link. Link emissions are aggregated as described above: sector area source contributions are obtained analytically. Off-link traffic emissions on a 2 -mile grid square are added into the sector area sources. In the street canyon submodel, a separate hourly emission rate is provided by the user for the link in question.

C. Plume Behavior. The model does not treat plume rise, and it does not treat fumigation or downwash except in the street canyon submodel . In the street canyon submodel , a helical circulation pattern is assumed.

D. Horizontal Wind Field. Input for the model is hourly wind speed and direction in tens of degrees. No variation of wind speed or direction with height is allowed. A constant, uniform (steady state) wind is assumed within each hour.

E. Vertical Wind Speed. This is assumed to be equal to zero except in the street canyon submodel, where a helical circulation pattern is assumed.

F. Horizontal Dispersion. Section averaging has a uniform distribution within sectors. Each section larger than 1 km. is divided into sectors of 22.5 degrees; sections within 1 km. of size are divided into sectors of 45 degrees.

G. Vertical Dispersion. The model utilizes a semiempirical/Gaussian plume. There are six stability classes, and each stability class is determined internally from user-supplied meteorological data (modified by Turner, 1964). Dispersion coefficients from McElroy and Pooles (1968) have been modified using information in Leighton and Ditmar (1953). No adjustments are made for variations in surface roughness, and the downwind distance variation of a (z) is assumed to ax (b) for purposes of doing analytic integration. In the street canyon submodel , an empirical function of wind speed and street width and direction is used.

H. Chemistry/Reaction Mechanism. This is not treated.

I. Physical Removal. This is not treated.

J. Background. The box model used to estimate contributions from upwind sources beyond 32 km. is based on wind speed, mixing height and annual fuel consumption. In the street canyon submodel , contributions from other streets are included in the background.

Current implementation:	Mini and mainframe computers
Current hardware:	(1) mainframe UNIVAC 1110, (2) CDC 6400, (3) IBM 360/50, (4) VAX 11/780
Software language(s):	FORTRAN, FORTRAN II, FORTRAN III, FORTRAN IV
Word size(s):	(1) --, (2) 60-bit, (3) 32-bit,
Operating systems:	VMS
Lines of source code:	2015
Number of subroutines:	19
Input requirements:	

Emission and meteorological data: Emissions are a function of the hour of the day and the day of the week, and meteorological parameters are functions of the hour of the day.

Input databases:	TEST DATA available with UNAMAP, RADIOSONDE and hourly surface data available from NCC, Federal Building, Asheville, NC 28801
Output format:	Hourly concentration values at each receptor; frequency distribution based on hourly values.
Source program storage:	45,000 words of memory CDC, 32K core UNIVAC
User manual:	Yes
System documentation:	Yes
Date of first version:	1972
Date of latest version:	1972
Date of latest documents:	1973
Machine interface:	Batch
Learning difficulty:	Medium-high
User support:	Yes
Continued enhancements:	Yes
Confidentiality:	Releasable to the general public
Statutory authority:	EPA guideline model (1978)
Update frequencies:	As part of UNAMAP, when errors are found and corrected or when changes are made, updated versions are usually released.

Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Physical loss out of element:	Yes
Variable wind speeds:	Yes
Nonreactive pollutant:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sublight:	Yes
Point sources:	No
Linear sources:	Yes
Area sources:	No
Complex topography:	No
Simple topography:	No
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	No
Time scale: Years	No
Street canyon submodel:	Yes

(5)

Model acronym:	**APRAC-2**
Model name:	Air Pollution Research Advisory Committee Model2
Contact:	Linda Larson
Contact address:	US EPA Region 9, Air & Hazardous Materials Div. 215 Fremont Street, San Francisco, CA 94105
Contact Telephone:	(415) 556-2004
Type of Model:	Air
Summary:	Estimates ambient air concentration for hydrocarbons, carbon monoxide, or oxides of nitrogen.

Abstract:

The APRAC-2 model is a revised version of the APRAC-1A diffusion model. It maintains basically the same approach to the simulation of atmospheric diffusion, but it incorporates recent advances in the estimation of vehicular emissions and in the dissemination of traffic information. One of the most important characteristics of the APRAC-2 model is its ability to make full use of the historic records and the projections available from the Federal Highway Administration's (FHWA) battery of computer programs. Mixing depth information from alternative sources can be used. The model now can provide as outputs the amount of pollutant emitted in grid squares throughout the area. The APRAC-2 model uses EPA's emissions calculation methodology from Supplement No. 5 to AP-42.

The model has two major components, a diffusion module (called DIEMOD) and an emission module (called EMOD). The emissions module can operate without the diffusion module, but the diffusion model requires the outputs of the emissions module as inputs. Each of the two modules has several major components. The emissions module has components to calculate tables of emissions, a component to determine emissions on each roadway link and a component that estimates the emissions within each grid square.

The three major functions of the diffusion model are to: (1) calculate diffusion, (2) derive, from conventional meteorological information, the stability, mixing depth and wind parameters used by the model, and (3) simulate small scale effects near the receptor. Diffusion calculations can be made for as many as 625 locations for a single hour, as many as 10 locations for a single day or for a year at a single station. There are two subroutines in the small-scale effects category; one treats canyon conditions and the other simulates traffic and dispersion in the vicinity of an intersection.

APRAC-2 can treat hydrocarbons, carbon monoxide, or oxides of nitrogen. Diffusion calculations make use of a receptor-oriented Gaussian plume model. Local winds at the receptor can be used, and they are interpolated from multiple wind inputs. Mixing heights may be calculated from sounding data or input directly. A small program is included for decoding Federal Highway Administration data tapes.

Document citations:

Heffter, J.L., and Taylor, A.D., A Regional Continental Scale Transport Diffusion and Deposition Model, Part I: Trajectory Model National Oceanic and Atmospheric Administration Technical Memoranda. ERL ARL-50 pp. 1-16, 1975.

Johnson, W.B., Dabberdt, W.F., Ludwig, F.L., and Allen, R.J., Field Study for Initial Evaluation of an Urban Diffusion Model for Carbon Monoxide, Comprehensive Report CRC and Environmental Protection Agency, Contract CAPA-3-68 (1-69), 1971.

Kircher, D.S., and Williams, M.E., Supplement No. 5 for Compilation of Air Pollutant Emission Factors (AP-42), Chapter 3 second edition, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (OAQPS), 1975.

Kunselman, R., McAdams, H.T, Domke, C.J., and Williams, M., Automobile Exhaust Emission Model Analysis Model, EPA Contract 68-01-0433, Calspan Corporation, Buffalo, New York, 1974.

Ludwig, F.L., "Urban Air Temperatures and Their Relation to Extra-Urban Meteorological Measurements," Proceedings of the Semiannual Meeting of the American Society of Heating, Refrigeration, and Air Conditioning Engineers, Survival Shelter Problems, Part II, San Francisco, pp. 40-45, January, 1970.

Ludwig, F.L., and Dabberdt, W.F., Evaluation of the APRAC's Urban Diffusion Model for Carbon Dioxide, Final Report, CRC and EPA Contract C APA-3-68 (1-69), 1972.

Ludwig, F.L., and Dabberdt, W.F., "Comparison of Two Atmospheric Stability Classification Schemes in an Urban Application," Journal of Applied Meteorology, 15, 1172-1176, 1976.

Ludwig, F.L., Johnson, W.B., Moon, A.E., and Mancuso, R.L., A Practical, Multipurpose Urban Diffusion Model for Carbon Monoxide, Final Report, Coordinating Administration Contract CPA 22-69-64, 1970.

Ludwig, F.L., and Kealoha, J.H.S., Selecting Sites for Carbon Monoxide Monitoring, Final Report, EPA Contract 68-02-1471, Stanford Research Institute, Menlo Park, California, 1975.

Mancuso, R.L., and Ludwig, F.L., User's Manual for the APRAC-1A Diffusion Model Computer Program, CRC and EPA, Contract CAPA-3-68 (1-69), 1972.

Sagi, G., and Campbell, L., "Vehicle Delay at Signalized Intersections," Traffic Engineering, 1969.

Sancys, R.C., Bader, P.A., and Dabberdt, W.F., ISMAP: A Traffic Emissions Dispersion Model for Mobile Pollution Sources, Prepared for the California Business Properties Association, Hawthorne, California, by the Stanford Research Institution, Menlo Park, California, 1975.

U.S. Department of Transportation, Urban Transportation Planning General Information, Federal Highway Administration, 1972.

Level of Validation: Medium

Assumptions:

The method utilized by APRAC-2 for computing emission factors has been described in detail by Kircher and Williams (1975). Percentages of vehicles operating in cold, hot transient and hot stabilized models are assumed to vary with time of day and from one part of a city to another. If land use categories are not specified, the model assumes that all central business district area types correspond to the same locale type. Core city areas are assumed to be commercial if their average weekday traffic exceeds 10,000; otherwise the locale is taken to be residential. The locale for areas that do not fit specified categories is taken to be rural or unclassified.

A Guassian-plume diffusion formulation is used for diffusion calculations. The model uses an atmospheric stability algorithm derived by Ludwig and Dabbert (1976). Daytime stability categories are based on wind speed and the strength of the incoming solar radiation.

Current implementation:	Mainframe computer
Current hardware:	Mainframe CDC 6400
Software language(s):	FORTRAN
Word size(s):	60-bit

Input requirements:

If FHWA traffic data are to be used, they must first be converted to a format compatible with the rest of the program. For IBM machines this is done with the program COMSIS, which will read and unpack the data and then create a file for subsequent use by the APRAC-2 program.

The input required to operate the EMOD module are as follows: the first 17 cards are all required to identify which options are to be used during the run and the other parameters that define the nature of the run. The next 72 cards define the diurnal traffic cycles appropriate to different kinds of roadway, areas of the city and days of the week.

At least 22 cards are required to operate the DIFMOD module. The first six cards are required to define the region, the types of calculations to be made and the coordinates of the receptors in kilometers with the origin at the same place as the emissions grid. Cards D-6 through D-9 define the length of the run, street canyon features, intersection link features and coordinates, holidays and pollutants to be treated. Cards D-10 through D-15b define upwind background concentrations; mixing depth input type; station, date, maximum and minimum temperatures, and daylight savings time; radiosonde data, weather data, wind data for up to 100 sites; intersection traffic parameters, and intersection signalization parameters.

Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes

Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	Yes
Point sources:	No
Linear sources:	Yes
Area sources:	No
Complex topography:	No
Simple topography:	No
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	No
Time scale: Years	No

(6)

Model acronym:	AQAM
Model name:	Air Quality Assessment Model
Sponsor:	Air Force Weapons Laboratory
Developer:	Argonne National Laboratory & later AFESC
Availability:	Public
Type of model:	Air
Summary:	A generalized air quality assessment model for Air Force operations.

Abstract:

An extensive set of emissions models for all air pollutant-generating activities, both stationary and mobile, on and around the airbase, including airborne flight operations, has been tested. This model is capable of handling multipollutant emissions from point, area or line sources categorized by aircraft, air base or environ origin at any air base with a time resolution of up to one hour. The emissions models calculate annual average emissions which are allocated in time according to various temporal distribution techniques.

A long-term model based on the well known "Air Quality Display Model" (AQDM) is used to estimate pollutant concentrations over a grid of receptors on a long-term basis in a manner quite analogous to the annual averages produced by AQDM, with the additional capability of monthly and limited diurnal time resolution. Meteorological input (wind speed and direction, and stability) to the long-term model is based on multiyear historical records of weather data. The necessary meteorological input data for each air base are contained on a magnetic tape prepared by the U.S. Air Force Environmental Technical Application Center.

Real-time, hourly average pollutant concentrations are calculated over a receptor grid by a short-term model using the conventional Gaussian plume technique which accounts for both lateral and vertical plume diffusion. The short-term model uses hourly average wind speed and direction, stability and mixing depth that are assumed constant over the hour for which a calculation is being performed.

Document citations:

A Generalized Air Quality Assessment Model for Air Force Operations, AFWL-TR-74-304.

Air Quality Assessment Model (AQAM) Field Data Collection Guide, AFWL-TR-75-220.

Air Quality Assessment Model (AQAM) Data Reduction and Operation Guide, AFWL-TR-75-307.

A Computerized Edit Program for the Air Quality Assessment Model (AQAM), AFWL-TR-76-68.

Principal users: Air Force

Assumptions:

Transport and dispersion of pollutant emissions are modeled using the steady state Gaussian plume formulation (based on a 1- hour averaging time) for point, area and line sources. Sources of finite initial volume are treated by a virtual source technique. Line sources are treated by an analytical integration over the length of the line, whereas square area sources are treated as pseudopoint sources located some distance upwind of the actual area source. Travel time and/or travel distance dependent dispersion coefficients are used to estimate lateral and vertical diffusion of the plume according to stability as determined by Turner's criteria. The effective emission height is estimated using the downwash rules of Briggs and plume rise equations due to Holland or Carson-Moses. Depth of the mixing layer is calculated using a model recently developed by the USAF which depends on surface weather observations and includes both mechanical and thermal contributions.

Current implementation: Mainframe computer
Current hardware: CDC 7600
Software language(s): FORTRAN
Word size(s): 60-bit
Input requirements:

Meteorological: 1 annual and 12 monthly for 7 daily time frames for mean; temperature, temperature range, heating degree hours, station pressure, pressure altitude, wind speed; percent time prime runaway is potentially active, wind stability cases and mixing depth. Point, area and line source parameters for aircraft, air base and environ sources.

Input databases: Meteorological data tapes are developed and run by USAF Environmental Technical Applications Center in Wash., D.C.

Output format:

Results are written in time blocks. Each time block is equivalent to the time period for which pollutant concentrations have been calculated. Within each time block a header record is written describing concentration data, time period, structure of receptor grid for each source category and total.

Load module storage: Up to 140K octal words of core
Data storage: Source inventory less than 150K octal words of core
User manual: Yes
System documentation: Yes
Date of first version: 1973
Date of latest documents: 1976
Machine interface: Batch
Learning difficulty: High
Continued enhancement: It was planned in AFWL-TR-74-304 document.
Confidentiality: Approved for public release; distribution unlimited.

Analytical features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sublight:	No
Point sources:	Yes
Linear sources:	Yes
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No (2)
Single element:	Yes
Simultaneous pollutant introduction:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	Yes
Time scale: Years	Yes
Variable space and time emission factors:	Yes
It is multielement but not interactive:	Yes

(7)

Model acronym:	AQDM
Model name:	Air Quality Display Model
Sponsor:	National Air Pollution Control Administration, DHHS, U.S. Public Health Service
Developer:	TRW Systems Group
Contact:	Joe Tikvart
Contact address:	USEPA Office of Air, Noise & Radiation Mutual Building 411 West Chapel Hill Street Durham, NC 28801
Contact telephone:	(919) 541-5262
Availability:	Public
Type of model:	Air
Summary description:	Estimates annual arithmetic average of SOx and particulate concentrations.

Abstract:

The Air Quality Display Model (AQAM) is a three-dimensional, steady state air model used in the evaluation of area sources in "rough" urban areas. The AQDM treats the physical processes of both transport and diffusion. The model is appropriate for examining areas ranging in size from small localized vicinities to whole urban areas, and it has a long-term application for the evaluation of seasonal or annual air quality variations.

Document citations:

Croke, E.J., et al., Regional Implementation Plan Evaluation Process, ANC/ES-DA-001, Argonne National Laboratory, Argonne, Illinois, July 1970.

National Air Pollution Control Administration, Air Quality Display Model, PB 189 194, Washington, DC, November 1969.

Level of validation: Medium-high

Assumptions:

The AQDM is a deterministic model that uses an analytically integrated solution technique. It assumes a steady state for air quality constituents and assumes Gaussian diffusion and homogeneous discrete atmospheric conditions.

The AQDM model does not simulate chemical processes, but it does treat the physical processes of transport and diffusion in "rough" urban areas. It uses a one layer discretization and a user-specific 14 x 14 grid. A 225 grid receptor with 12 additional receptor points is also user-specified. The fixed-point meteorological data do not describe micrometeorological variations within the city, nor do they describe "urban heat island" air circulations. The model has a sensitivity to effective stack height, wind speed and wind stability. It is limited to SOx and suspended particulates, and is designed for annual average and seasonal applications.

Current implementation:	Mainframe computer
Current hardware:	Mainframe IBM 360/40 or equivalent
Software language(s):	FORTRAN
Word size(s):	32-bit

Input requirements:

Inputs to the model for initial setup and calibration include: Point and area residual discharges and stack parameters which consist of height, diameter, temperature and exit velocity; meteorological data containing wind speed and direction, stability and mixing height; and several ambient air concentration measurements. Model data requirements for verification incorporate the above meteorological data and ambient air concentration measurements.

Output format:

Outputs for the model include ambient concentration values given at grid locations, ground level or other user-selected points. These values are given in the form of tabular printouts or card decks for use with CALCOMP or SYMAP plot programs. Some of the special features of the AQDM output are its statistical output routines, receptor contribution analysis and calibration subroutine.

Load module storage:	300 Kbytes core storage		
User manual:	Yes		
Date of first version:	1969		
Continued enhancement:	No		
Analytical features for Model:	Air Quality		
Reactive pollutant:	No		
Nonreactive pollutant:	Yes		
Physical loss out of elements:	No	Time scale: Years:	Yes
Variable wind speeds:	Yes	1 or 2 pollutants released simultaneously no reaction:	Yes
Variable wind direction:	Yes		
Variable inversion base height:	Yes		
Variable reactive pollutants:	No		
Variable incident sunlight:	No		
Point sources:	Yes		
Linear sources:	No		
Area sources:	Yes		
Complex topography:	No		
Simple topography:	Yes		
Vertical pollutant dispersion:	Yes		
Crosswind pollutant dispersion:	Yes		
Multielement interactive:	No		
Single element:	Yes		
Simultaneous pollutant introductions:	Yes		
Regional and subcontinental:	No		
Localized:	Yes		
Time scale: Hours:	No		
Time scale: Days:	Yes		

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Model acronym:	ATDL and (Simple ATDL)
Model name:	Atmospheric Turbulence and Diffusion Laboratory Computer Model for Dispersion from Multiple Sources
Sponsor:	NOAA and AEC
Developer:	Air Resources Atmospheric Turbulence and Diffusion Laboratory, NOAA, Oak Ridge
Contact:	Steven R. Hanna
Contact address:	Air Resources ATDL, NOAA, Oak Ridge, TN 37830
Availability:	Public
Type of model:	Air
Summary:	Straightforward model for estimating surface concentrations due to point and area sources.

Abstract:

The model estimates surface concentrations of pollutants in regions containing multiple point and area sources. The simple ATDL box model reduces to concentration proportional to source strength and inversely proportional to wind speed. A dimensionless parameter for a given stability also enters into the model.

Document citations:

Hanna, S.R., Description of ATDL Computer Model for Dispersion from Multiple Sources, paper presented during the Proceedings of the 2nd Annual Industrial Air Pollution Control Conference, Knoxville, TN, 20-21 April 1972.

Hanna, S.R., Dry Desposition and Precipitation Scavenging in the ATDL Computer Model for Dispersion from Multiple Point and Area Sources, ATDL Contribution File No. 71, Oak Ridge National Lab., TN, 1973.

Gifford, F., The Simple ATDL Urban Air Pollution Model, paper presented during the Proceedings of the 4th Meeting of NATO/CCMS Panel on Modeling, 30 May 1973.

Validations:	Medium-high

Assumptions:

Gaussian dispersion kernel is used where the dependence on y is removed for area sources because plumes are generally quite narrow. Assumes that G_2 obeys a power law and that the area source strength in any grid square is uniform across that square. Steady state is assumed for a reasonable period of averaging the meteorological and source conditions.

Current implementation:	Mainframe computer
Current hardware:	IBM 360/65
Software language(s):	FORTRAN IV
Word size(s):	32-bit
Lines of source code:	350

Input requirements: Grid dimensions, wind speed, wind direction, frequency, source strengths and heights

Output format:

Wind direction freq. distribution, 9 x 9 matrix of direction frequency distribution divided by wind speed, other inputs, concentrations due to area sources, point sources, and all sources, ratio of concentration due to area sources to concentrations due to all sources.

Date of first version: 1970
Date of latest version: 1972
Machine interface: Batch
Learning difficulty: Low
User support: Yes

Analytical Features for Model:	Air Quality Orig/Update	Simple
Reactive pollutant:	No	No
Nonreactive pollutant:	Yes	Yes
Physical loss out of element:	No/Yes	No
Variable wind speeds:	Yes	Yes
Variable wind direction:	Yes	No
Variable inversion base height:	No	No
Variable reactive pollutants:	No	No
Variable incident sunlight:	No	No
Point sources:	Yes	No
Linear sources:	No	No
Area sources:	Yes	Yes
Complex topography:	No	No
Simple topography:	Yes	Yes
Vertical pollutant dispersion:	Yes	Yes
Crosswind pollutant dispersion:	No	No
Multielement interactive:	No	No
Single element:	Yes	Yes
Simultaneous pollutant introductions:	Yes	No
Regional and sub-continental:	No	No
Localized:	Yes	Yes
Time scale: Hours:	No	No
Time scale: Days:	Yes	Yes
Time scale: Years:	Yes	Yes

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Model acronym:	ATM
Model name:	Comprehensive Atmospheric Transport and Diffusion Model
Sponsor:	U.S. Energy Research and Development Administration
Developer:	Oak Ridge National Laboratory
Contact:	Joan Lefler
Contact address:	EPA Office of Toxic Substances Evaluation Division 401 M Street Washington, DC 20460
Contact telephone:	(202) 426-0724
Availability:	Public
Type of model:	Air
Summary:	Estimates atmospheric concentrations and wetfall and dryfall deposition.

Abstract:

This model describes movement of trace materials through the atmosphere and provides a means of calculating input deposition of trace contaminants to a watershed.

The comprehensive version of the Atmospheric Transport Model includes the effect of aerodynamic roughness of dispersion constants, clarifies the roles of the terminal velocity and deposition velocity, incorporates a tilting plume for heavy particulates, and includes an episodic calculation of exposure maxima. This model also limits the maximum value of the dispersion constants in order to retain the emitted material in the planetary boundary later. The structure of the program has been modularized in order to clarify the flow of calculation and allow more flexibility. Values for atmospheric concentration as well as both wetfall and dryfall deposition are calculated.

A modified version implemented on a minicomputer calculates population distributions about a point source as well as the concentration estimates. Annual average exposure is estimated based on these calculations.

Document citations:

Culkowski, W.M., and Patterson, M.R., A Comprehensive Atmospheric Transport and Diffusion Model, ORNL/NSF/EATC-17, Oak Ridge National Lab., Oak Ridge, TN, 1976.

Principal users:	Oak Ridge National Lab - Environmental Sciences Division EPA - OTS
Level of validation:	Medium

Assumptions:

Steady state gaussian algorithm using joint frequency table of stability class, wind direction and wind speed class. The model considers washout, wetfall and dryfall deposition processes but not rainfall. Deposition velocity is assumed equal to the terminal velocity if the terminal velocity exceeds .01 M/S: otherwise material is assumed to have a deposition velocity of .01 M/S. Bouyant plume rise based on Brigg's formulation. Single centroid approximation for area sources. Terminal velocity given by Stokes' law for Particles assigned deposition .01 M/S and terminal velocity 0.0 M/S for gases.

Current implementation:	Minicomputer ; Mainframe computer
Current hardware:	IBM 370; VAX 11/780
Software language(s):	FORTRAN II; FORTRAN IV-Plus
Word size(s):	32-bit
Operating system(s):	VMS
Lines of source code:	1550
Number of subroutines:	14

Input requirements:

Joint frequency table of stability, wind direction and wind speed class; mixing height source characteristics - heights and plume rise parameters pollutant characteristics - diameter + density if particulate; diffusivity if gas.

Input databases:	NCC STAR DATA

Output format:

Input data; summary tables for each source type of deposition rate and increment to concentration; summary table cumulative over all sources types of dry deposition, wet deposition, total deposition and concentration.

Source program storage:	133.5 Kbytes
Load module storage:	81.5 Kbytes
Data storage:	Max = 73.5 bytes; min = 9 Kbytes
User manual:	Yes
Systems documentation:	Yes
Date of first version:	1973
Date of latest version:	1976
Date of latest document:	1976
Machine interface:	Batch; Prompt - VAX 11/780
Learning difficulty:	Medium
Output interpretation:	Low
User support:	Yes
Debugging maintenance:	Yes
Continued enhancement:	Yes
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	Yes
Variable wind speeds:	Yes
Variable wind direction:	Yes

Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point source:	Yes
Linear sources:	Yes
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours:	No
Time scale: Days:	Yes
Time scale: Years:	Yes
User-supplied half-life:	Yes

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Model Acronym:	**AVAP**
Model name:	Airport Vicinity Air Pollution Model
Sponsor:	U.S. Department of Transportation
Developer:	Argonne Nat'l Lab., Energy & Environmental Systems Division
Contact address:	Argonne National Laboratory Energy and Environmental Systems Division 9700 S. Cass Avenue Argonne, IL 60439
Contact telephone:	FTS 972-3786
Availability:	Unlimited
Type of Model:	Air
Summary:	Comprehensive airport simulation model to estimate short-term pollutant conc.

Abstract:

The model is a comprehensive airport simulation model which can serve as a tool in evaluating the total air quality impact of all airport operations on the airport vicinity. The model evaluates aircraft, airport nonaircraft and environ sources and computes pollutant concentrations due to each.

Document citations:

Wang, L.T, Rote, D.M., and Conley, L., Airport Vicinity Air Pollution Study - Model Application and Validation and Air Quality Impact Analysis at Washington Airport, Federal Aviation Administration Report Number FAA-RD-74-132m, July 1974.

Wang, L.T., Conley, L.A., and Rote, D., Airport Vicinity Air Pollution Model User's Guide, Federal Aviation Administration Report Number FAA-RD-75-230, December 1975.

Principal users:	Federal Aviation Administration
Level of validation:	Medium for Washington National Airport

Assumptions:

Gaussian plume formulation, plume rise for point sources by the Carson-Moses family, stack downwash by Briggs' formulation, area sources are treated as either "far" or "near," wind profile law as determined by DeMarrais. Elevated inversion layers are assumed to act as a perfect reflector.

Current implementation:	Mainframe computer
Current hardware:	IBM 370/195
Software language(s):	FORTRAN IV
Word size(s):	32-bit
Operating system(s):	OS/MVT/LASP* * operating system in multiprogramming with a variable number of task/local attached support processors.
Lines of source code:	3000
Number of subroutines:	21

Input requirements:	Input is required for airport configuration, aircraft and ground vehicle operation, stationary emission sources and meteorology.

Output format:

Computed air quality concentrations due to aircraft, airport nonaircraft, environ sources, and total are printed for each hour and 24-hour summary average concentrations are printed. Complete tabulation of input data.

Source program storage:	240000 bytes
User manual:	Yes
Systems documentation:	Yes
Machine interface:	Batch
Learning difficulty:	Medium
Output interpretation;	Medium
Confidentiality:	Unlimited availability
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	Yes
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	Yes
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant. dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	Yes
Time scale: Years:	No
Stability determination:	Yes

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Model acronym:	**AVGTIME**
Model name:	Averaging Time Model
Developer:	Ralph Larsen
Contact:	Ralph Larsen
Contact address:	US EPA Environmental Sciences Research Lab, Mail Drop 80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	Public
Type of model:	Air
Summary:	Estimates maximum concentration and any percentile for various averaging times.

Abstract:

AVGTIME is a mathematical model based on two characteristics that are often demonstrated by air quality data: (1) air pollutant concentrations tend to be lognormally distributed for all averaging times and (2) median (50 percentile) concentrations tend to be proportional to averaging time raised to an exponent and thus plot as a straight line on logarithmic graph paper. Two percentile concentrations (at the same or at different averaging times) are read into the model and concentrations for the maxima or any percentiles can then be calculated for other averaging times. Two input concentrations are entered into the proper equation to calculate two output parameters; the geometric mean and standard geometric deviation for one averaging time. The other equations are then used to calculate these two output parameters, the maxima and the concentrations for any desired percentiles for any other averaging times.

Document citations:

Larsen, R.I.," A New Mathematical Model of Air Pollutant Concentration, Averaging Time, and Frequency," Journal of the Air Pollutant Control Assoc., 19 (1), 2430, 1969.

Larsen, R.I., A Mathematical Model for Relating Air Quality Measurements to Air Quality Standards, Publ. AP-89, U.S. Environmental Protection Agency. Research Triangle Park, NC, 56 pp., 1971.

Larsen, R.I., "An Air Quality Data Analysis System for Interrelating Effects, Standards, and Needed Source Reductions: Part 4. A Three-Parameter Averaging-Time Model," Journal of the Air Pollution Control Assoc., 27 (5), 454-459, 1977.

Principal users:

The averaging time model has been used to relate air quality measurements to air quality standards to determine overall percent emission reductions needed to achieve air quality standards. Air quality data for one averaging time have been used to calculate percentiles and expected maxima for other averaging times for which air quality standards have been written.

Validation: OAQPS has reviewed and approved.

Assumptions:

Analyses of air pollutant concentration data suggest that urban concentrations often tend to fit a general mathematical model having the following three characteristics:

(1) Pollutant concentrations are lognormally distributed for all averaging times.
(2) Median concentrations are proportional to averaging time raised to an exponent.
(3) Maximum concentrations are approximately inversely proportional to averaging time raise to an exponent.

A two-parameter averaging time model with the above three characteristics has been developed. Air pollutant concentrations measured near isolated point sources often do not fit a two-parameter lognormal distribution very well. Such data often do fit a three-parameter lognormal distribution fairly well. A three-parameter averaging time model has, therefore, been developed to model such data.

Current implementation:	Mainframe computer
Current hardware:	Mainframe Univac or IBM
Software language(s):	FORTRAN

Input requirements:

The user inputs any two air quality measurements for the two-parameter model. These two input parameters might be the concentrations exceeded 0.1% and 30% of the time for 1-hour average concentrations, for instance. The two input concentrations can be at the same or different averaging times. The user inputs any three air quality measurements into the three-parameter model, at either the same or at different averaging times.

Output format:

The equations mentioned under "Abstract" are used to calculate expected concentrations. Expected highest and second highest concentrations for various averaging times (1, 3, 8 and 24 hr. and 1 yr.) can be easily determined by using Table II in Ref. 3. The three-parameter averaging time model is more difficult to use than is the two-parameter model. Trial and error techniques can be used to calculate the third parameter (a constant that is added or subtracted from each of the three input concentration measurements) needed to fit the data to a two-parameter lognormal distribution. Alternatively, a 500-card FORTRAN job deck is available that will calculate expected maxima and percentile concentrations for several averaging times based on three concentration measurements input to the model. The job deck is available on request from the "Technical Contact" listed.

User manual:	No
Date of latest document:	1977
Learining difficulty:	Low
Analytical Features for Model:	Air Quality
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	No

Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	No
Linear sources:	No
Area sources:	No
Complex topography:	Yes
Simple topography:	Yes
Vertical pollutant dispersion:	No
Crosswind pollutant dispersion:	No
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introduction:	No
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	Yes
Time scale: Years	Yes

Due to nature of the averaging time model the categories, except for time scale, were difficult to apply.

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Model acronym:	**BLP**
Model name:	Buoyant Line and Point Source Dispersion Model
Sponsor:	ERT and EPA
Developer:	Environmental Research and Technology, Inc.
Type of model:	Air
Summary:	Designed to handle unique modeling problems at sources such as aluminum reduction plants.

Abstract:

BLP (buoyant line and point source dispersion model) is a Gaussian plume dispersion model designed to handle unique modeling problems associated with aluminum reduction plants and other industrial sources where plume rise and downwash effects from stationary line sources are important.

Document citations:

Schulman, L.L., and Scire, J.S., Buoyant Line and Point Source (BLP) Dispersion Model User's Guide, Document P-73048, Environmental Research and Technology, Inc., Concord, MA, (NTIS Accession Number PB 81 164 642).

Schulman, L.L., and Scire, J.S., Development of an Air Quality Dispersion Model for Aluminum Reduction Plants, Document P-7304A, Environmental Research and Technology, Inc., Concord, MA, (NTIS Accession No. PB 81 164 634).

Assumptions:	Gaussian plume
Current implementations:	Mainframe computer
Current hardware:	UNIVAC 1100
Software language(s):	FORTRAN
Word size(s):	36-bit
Line of source code:	2062
Number of subroutines:	21
Module storage:	20K core
User manual:	Yes
Analytical Feature for Model:	Air
Point sources:	Yes
Linear sources:	Yes
Area sources:	No

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Model acronym:	CDM
Model name:	Climatological Dispersion Model
Sponsor:	EPA
Developer:	EPA
Contact:	D. Bruce Turner
Contact address:	EPA Environmental Sciences Research Lab., Mail Drop 80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	See APRAC-1A
Type of Model:	Air
Summary:	Estimates long-term concentrations of non-reactive pollutants from area and point sources.

Abstract:

The Climatological Dispersion Model determines long-term (seasonal or annual) quasi-stable pollutant concentrations at any ground level receptor using average emission rates from point and area sources and a joint frequency distribution of wind direction, wind speed, and stability for the same period.

Document citations:

Busse, A.D., and Zimmerman, J.R., User's Guide for the Climatological Dispersion Model, EPA-R4-73-024, NTIS PB 227-346/AS.

Brubaker, K.L., Brown, P., and Cirillo, R.R., Addendum to User's Guide for Climatological Dispersion Model, EPA-450/3-77-015, NTIS PB 274-040.

Source programs available as part of UNAMAP (Version 3), $420, PB 277-193, NTIS, Springfield, VA 22161.

Principal users:	Widely used in the development of Air Pollution control programs.
Validation:	OAQPS has reviewed and approved this model.

Assumptions:

The model assumes that there are no terrain differences between the source and receptors. A single emission rate is allowed for each point and area source. For area sources, area integrations are done numerically, one 22.5-degree sector at a time; sampling at discrete points is defined by specific radial and angular intervals on a polar grid centered on the receptor. Plume Behavior: Only Briggs (1971) neutral/unstable formula is used by the model. If the stack height plus the plume rise is greater than the mixing height, then the ground level concentrations are assumed to be equal to zero. As an alternate to the Briggs formula, the input value of the plume rise times the wind speed for each point source can be used. No plume rise is calculated for area sources. CDMQC and CDM do not treat fumigation or downwash. Horizontal Wind Field: The models use a climatological approach and utilize 16 wind directions and six wind speed classes. The wind speed is corrected for the release height based on the power law variation

exponents from DeMarrais (1959). A constant, uniform (steady state) wind is assumed. Vertical Wind Speed: This is assumed to be equal to zero. Horizontal Dispersion: The model uses a climatological approach and assumes a uniform distribution within each of 16 sectors (narr-plume approximation). Averaging time for the models is 1 month to 1 year. Vertical Dispersion: The models use a semiempirical/Gaussian plume with five stability classes as defined by Turner (1964). Neutral stability is split into day/night cases on input, and dispersion coefficients are taken from Turner (1970). The stability classes for area sources are decreased by one category from the input values to account for urban effects. Neutral dispersion coefficients are used for all neutral and stable classes. No provision is made for variations in surface roughness. Chemistry, Reaction Mechanism: The model uses exponential decay and a user-input half-life. The same rate constant is always applied. Background: A single constant background value is input for each pollutant.

Current implementation:	Minicomputer, mainframe computer
Current hardware:	Mainframe UNIVAC 1110, IBM 360/370, VAX 11/780
Software language(s):	FORTRAN V, FORTRAN IV (Level G), FORTRAN IV Plus
Word size(s):	32-bit
Operating systems:	VMS
Lines of source code:	1313
Number of subroutines:	5
Input requirements:	

Meteorological data; point and area source data in rectangular grid array joint frequency function, mixing height

Available databases:	DAY-NIGHT, Version of STAR DATA from NCC
Output format:	Input data; 1 month to 1 year averaging simulated point and area concentration rose for each receptor.
Source program storage:	20K core
User manual:	Yes
System documentation:	Yes
Date of first version:	1968 by Martin and Tikuart
Date of latest documents:	1973
Machine interface:	Batch
Learning difficulty:	Low-medium
User support:	Yes
Continued enhancement:	Yes, CDMQC
Confidentiality:	Release unlimited
Statutory authority:	EPA guideline model (1978)
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speed:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No

Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and Subcontinental:	No
Localized:	Yes
Time scale: Hours	No
Time scale: Days	Yes
Time scale: Years	Yes
Two pollutants may be considered simultaneously:	Yes
User-supplied decay half-life:	Yes

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Model acronym:	CDMQC
Model name:	Climatological Dispersion Model
Sponsor:	EPA
Developer:	Argonne National Laboratory
Contact:	D. Burce Turner
Contact address:	EPA Env. Sciences Research Lab., Mail Drop 80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	Public
Type of model:	Air
Summary:	CDM with calibration, contribution lists and averaging time transformations.

Abstract:

This algorithm is the Climatological Dispersion Model (CDM) altered to provide implementation: of calibration, of individual point and area source contribution lists, and of averaging time transformations. The basic algorithms to calculate pollutant concentrations used in the CDM have not been modified, and results obtained using CDM may be reproduced using the CDMQC.

Document citations:

Busse, A.D., and Zimmerman, J.R., User's Guide for the Climatological Dispersion Model, EPA-R4-73-024, NTIS PB 227-346/AS.

Brubaker, K.L., Brown, P., and Cirillo, R.R., Addendum to User's Guide for Climatological Dispersion Model, EPA-450/3-77-015, NTIS PB 274-040.

Source programs available as part of UNAMAP (Version 3), $20, PB 277-193, NTIS, Springfield, VA 22161.

Validation:	OAQPS has reviewed and approved this model.

Assumptions:

Same as CDM with additional assumptions: 1) that the actual frequency distribution of pollutant concentration values is approximately lognormal, 2) the observed concentration value at each receptor is taken to be the measured value at the receptor minus the background value and 3) that area source emissions are relatively uniform.

Current impleme tion:	Minicomputer and mainframe computer
Current hardware:	Mainframe UNIVAC 1110 VAX 11/780
Software language(s):	FORTRAN V and FORTRAN IV Plus
Word size(s):	32-bit
Operating system(s):	VMS
Lines of source code:	1988
Number of subroutines:	11

Input requirements:

Meteorological data; point and area source data in rectangular and array arithmetic mean background concentration; joint frequency function, mixing height.

Input databases: Day-night version of STAR data from NCC

Output format:

Input data; 1 month to 1 year averaging simulated (arithmetic mean only); arbitrary averaging time by the Larsen (1969) procedure (typically 1-24 hours); an arbitrary number and location of receptors; an individual point and capability list for each receptor; point and area concentration rose for each receptor.

Source program storage:	48K core
User manual:	Yes
Systems documentation:	Yes
Date of first version:	1977
Date of latest documents:	1977
Type of machine interface:	Batch
Learning difficulty:	medium
User support:	Yes
Confidentiality:	Release unlimited
Statutory authority:	EPA Guideline Model (1978)
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element (see No. 1 below for additional information)	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes

Multielement interactive:	No
Single element: (see No. 2 below)	
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	Yes
Time scale: Years	Yes
1. User-supplied decay half-life:	Yes
2. Two pollutants may be considered simultaneously:	Yes

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Model acronym:	**CRSTER**
Model name:	Single Source Model
Sponsor:	USEPA Office of Air and Waste Management Office of Air Quality Planning and Standards
Developer:	same as above
Contact:	D. Bruce Turner
Contact address:	EPA Environmental Science's Research Lab Mail Drop 80 Research Triangle Park, NC 27711
Contact telephone:	(919)541-4564
Availability:	(see APRAC - 1A)
Type of model:	Air
Summary description:	Steady state, Gaussian plume dispersion model designed for point source applications.

Abstract:

This algorithm estimates ground-level concentrations resulting from up to 19 co-located elevated stack emissions for an entire year and prints out the highest and second highest 1-hour, 3-hour and 24-hour concentrations as well as the annual mean concentrations at a set of 180 receptors (5 distances by 36 azimuths). The algorithm is based on a modified form of the steady state Gaussian plume equation which uses empirical dispersion coefficients and includes adjustments for plume rise and limited mixing. Terrain adjustments are made as long as the surrounding terrain is physically lower than the lowest stack height input. Pollutant concentrations for each averaging time are computed for discrete, nonoverlapping time periods (no running averages are computed) using measured hourly values of wind speed and direction, and estimated hourly values of atmospheric stability and mixing height.

Document citations:

User's Manual for Single Source (CRSTER) Model, EPA-450/2-013, NTIS, PB 271 360.

Source program available as part of UNAMAP, (Version 3), $420, NTIS, PB 277 193, Springfield, VA 22161.

Principal users:	Used extensively by EPA to estimate the air quality impact of fossil fueled steam-electric power plants and selected industrial emission sources.
Level of validation:	Medium

Assumptions:

Source Receptor Relationship. Up to 19 point sources, but no area sources, can be run. All point sources are assumed to be at the same location, and a unique stack height is assumed to each source. Receptor locations are restricted to 36 azimuths (every 10 degrees) and five user-specified radial distances. There is a unique topographic elevation for each receptor which must be below the top of the stack.

Emission Rate. The model assumes a unique average emission rate for each source, and monthly variations in the emission rate were allowed.

Chemical Composition.This is treated as a single inert pollutant.

Plume Behavior. The model uses Briggs (8), (9), (10) final plume rise formulas, and does not treat fumigation or downwash. If the plume height exceeds the mixing height, concentrations further downwind are assumed to be equal to zero.

Horizontal Wind Field. The model uses user-supplied hourly wind direction (nearest 10 degrees), internally modified by the addition of random integer values between -4 degrees and +5 degrees. Wind speeds are corrected for release height based on power law variations and exponents from DeMarrais (6); different exponents are used for different stability classes, and the reference height is equal to 10 meters. A constant, uniform (steady state) wind is assumed within each hour.

Vertical Wind Speed. This is assumed to be equal to zero.

Horizontal Dispersion. The model assumes a semiempirical/Gaussian plume. Seven stability classes are used: Turner Class 7 is an extremely stable, elevated plume, assumed not to touch the ground. Dispersion coefficients are from Turner, and no further adjustments are made for variations in surface roughness, transport or averaging time.

Vertical Dispersion. A Semiempirical/Gaussian plume is used, and the model utilizes seven stability classes. Dispersion coefficients are from Turner, and no further adjustments are made.

Chemistry/Reaction Mechanism. This is not treated.

Physical Removal. This is not treated.

Background. This is not treated.

Current implementation:	Minicomputer; Mainframe computer
Current hardware:	Mainframe UNIVAC 1110, VAX 11/780
Software language(s):	FORTRAN V - language for execution on a Univax 1100 series computer and is compatible with most FORTRAN IV compilers on other types of computers. FORTRAN IV-Plus
Word size(s):	36-bit, 32-bit
Operating system(s):	VMS
Lines of source code:	1728
Number of subroutines:	4
Input requirements:	Meteorological data - surface and upper air source emissions data.
Input databases:	NCC hourly surface observations in card 144 format; NCC twice daily mixing heights.

Output format:

Highest and second highest concentrations for the year at each receptor for averaging times of 1, 33 and 24 hours, plus a user-selected averaging time which may be 2, 4, 6, 8 or 12 hours; an annual arithmetic average at each receptor is given; highest 1-hour and 24-hour concentrations over the receptor field for each day; hourly concentrations for each receptor on magnetic tape.

Source program storage:	28K core
User manual:	Yes
Systems documentation:	Yes
Date of first version:	1972
Date of latest version:	1977
Date of latest documents:	1977
Machine interface:	Batch
Learning difficulty:	Medium
Output interpretation:	Low
User support:	Yes
Confidentiality:	Release unlimited
Statutory authority:	EPA Guideline Model (1978)
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion	Yes
Crosswind pollutant: dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	No
Localized:	Yes

Time scale:	Hours	Yes
Time scale:	Days	Yes
Time scale:	Years	Yes

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Model acronym:	**CRSTER2**
Model name:	Multisource · CRSTER
Contract:	Lewis H. Nagler
Contact address:	EPA/NDAA - Air Facilities Branch EPA Region 4 Atlanta, GA 20265
Contact telephone:	(404) 881-2786
Type of model:	Air
Summary:	Multiple-emission point, steady state, Gaussian dispersion for ground level concentrations.

Abstract:

While essentially the same in function as CRSTER, CRSTER 2 will allow separation of multiple emission points.

Document citation:

User Information for the Modified CRSTER Program (EPA Information Cleaning-house files)

User's Manual for Single Source (CRSTER) model, EPA-450/2-77-013, NTIS: PB 271 360.

Validation:	OAQPS has reviewed, not yet approved.
Assumptions:	Same as CRSTER
Current implementation:	Mainframe computer
Current hardware:	Mainframe UNIVAC 1110
Software language(s):	FORTRAN V
Word size(s):	36-bit
Input requirements:	

Differs from CRSTER in that distinct special coordinates can be assigned to each point of emissions. Also, this model can handle an increased number of sources and receptors, and stack data can be input in English or metric units.

Output formats:

Basically, the same as CRSTER, but stack and receptor coordinates can be output in a format for use by the CALCOMP plotter.

Load module storage:	28K core
User manual:	Yes
Machine interface:	Batch
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes

Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Simultaneous pollutant introduction:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	Yes
Time scale: Years	Yes

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Model acronym:	HIWAY
Model name:	Highway Air Pollution Model
Sponsor:	US EPA, National Environmental Research Center, Office of Research and Development
Developer:	Same as above
Contact:	D. Bruce Turner
Contact address:	EPA Environmental Sciences Research Lab, Mail Drop 80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	See APRAC-1A
Type of model:	Air
Summary:	Estimates the concentrations of nonreactive pollutants from highway traffic.

Abstract:

This steady state Gaussian model can be applied to determine air pollution concentrations at receptor locations downwind of "at-grade" and "cut-section" highways located in relatively uncomplicated terrain. For an at-grade highway, each lane of traffic is modeled as though it were a finite, uniformly emitting line source of pollution. For the cut section, the top of the cut is considered an area source. The area source is simulated by using ten line sources of equal source strength. The total source strength equals the total emissions from the lanes in the cut. The air pollution concentration representative of hourly averaging times at a downwind receptor location is found by a numerical integration along the length of each lane and at summing of the contributions from each lane. With the exception of receptors directly on the highway or within the cut, the model is applicable for any wind direction, highway orientation and receptor location. The model was developed for situations in which horizontal wind flow occurs. The model cannot consider complex terrain or large obstructions to the flow such as buildings or large trees.

Document citations:

User's Guide for HIWAY, EAP-650/4-74-008; NTIS PB 239-944/AS.

Source program available as part of UNAMAP (Version 3), $420, PB 277-193, NTIS, Springfield, VA 22161.

Validation: Reviewed and approved by OAQPS.

Assumptions:

Source-Receptor Relationship: The model uses a horizontal finite line with multiple line sources (up to 24 lines). These are straight lines, arbitrary in orientation and length. One road or highway segment is run at a time. Receptors are arbitrarily located, downwind of the source, with a unique source-receptor distance defined. Arbitrary receptor heights and arbitrary release heights are used. In the cut-section mode receptors cannot be located in the cut, and emissions treated as coming from 10 equal uniform line sources at the top of the cut. A flat terrain is assumed, and line

sources are treated as a sequence of point sources; the number is such that convergence to within 2% is achieved.

Emission rate: This is not applicable to the model.

Chemical Composition: This is not applicable to the model.

Plume Behavior: This is not treated.

Horizontal Wind Field: The user specifies arbitrary wind speed and direction. No variation of wind speed and direction with height is allowed, and a uniform, constant (steady state) wind is assumed.

Vertical Wind Speed: This is assumed to be equal to zero.

Horizontal Dispersion: The model uses a semiempirical/Gaussian plume, and the user specifies which of six stability classes are to be used: Turner (1964) dispersion coefficients used are from Turner (1969); for distances less than 100 m, dispersion coefficients from Zimmerman and Thompson (1975) are used. In the level grade mode, the initial value of the dispersion coefficient is 3 meters. In the cut-section mode, the initial value of the dispersion coefficient is approximated as a function of the wind speed. No further adjustments to the dispersion coefficients are made.

Vertical Dispersion: The model uses a semiempirical /Gaussian plume in which the user specifies stability class. Dispersion coefficients used are from Turner (1969); for distances less than 100 m, dispersion coefficients from Zimmerman and Thompson (1975) are used. In the level grade mode, the initial O_z is equal to a function of the wind speed.

Chemistry/Reaction Mechanism. This is not treated.

Physical Removal. This is not treated.

Background. This is not treated.

Current implementation:	Minicomputer, mainframe computer
Current hardware:	Mainframe UNIVAC 110, VAX 11/780
Software language(s):	FORTRAN, FORTRAN IV-Plus
Word size(s):	32-bit
Operating system(s):	VMS
Lines of source code:	1300
Number of subroutines:	6
Input requirements:	

Initial setup and calibration needs (1) in batch mode; residual discharges for vehicular line sources; in interactive mode; residual discharges (or they may be requested from the program); (2) meteorological data; wind speed, wind direction, stability class, mixing height; (3) ambient air concentration measurements. Model verification = input of meteorological data and ambient air concentrations.

Output format:	Includes a printout of the 1-hour average concentration of each receptor.
Source program storage:	11K core
User manual:	Yes
Systems documentation:	Yes
Latest documentation:	1975
Machine interface:	Interactive batch
Learning difficulty:	Low
User support:	Yes
Continued enhancement:	Yes with HIWAY 2
Confidentiality:	Release unlimited
Statutory authority:	This is an EPA guideline Model (1978)
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants;	No
Variable incident sunlight:	No
Point sources:	No
Linear sources:	Yes
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No

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Model acronym:	**HIWAY-II**
Model name:	Hiway-2: A Highway Air Pollution Model
Contact:	William Peterson
Contact address:	US EPA Environmental Sciences Research Lab, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	(See Aprac-1A)
Type of model:	Air
Summary:	Estimates hourly concentrations of nonreactive pollutants downwind of roadways.

Abstract:

HIWAY-2 is a batch and interactive program which computes the hourly concentrations of nonreactive pollutants downwind of roadways. It is applicable for uniform wind conditions and level terrain. Although best suited for at-grade highways, it can also be applied to depressed highways (cut sections). The user specifies geometry and emissions of roadway segment. Meteorological conditions to be simulated, and receptor coordinates and height of receptor above ground.

Document citations:

Petersen, W.B., User's Guide for HIWAY-2: A Highway Air Pollution Model, U.S. Environmental Protection Agency, EPA-600/8-80-018, Research Triangle Park, NC, 1980, p. 70.

Suggestions for Improvement of the EPA- HIWAY Model, JAPCA. 30, 6, 1980, pp. 247-356.

Validation: OAQPS reviewed and approved.

Assumptions:

Source-Receptor Relationship: The model uses a horizontal finite line with multiple line sources (up to 24 lines). These are straight lines, arbitrary in orientation and length. Receptors are arbitrarily located, downwind of the sources, with a unique source-receptor distance defined. Arbitrary receptor heights and arbitrary release heights are used. In the cut-section mode, receptors cannot be located in the cut and emissions treated as coming from 10 equal uniform line sources at the top of the cut. A flat terrain is assumed, and line sources are treated as a sequence of point sources; the number is such that convergence to within 2% is achieved.

Emission Rate: A constant uniform emission rate for each lane is assumed.

Chemical Composition: This is not applicable to the model.

Plume Behavior: This is not treated.

Horizontal Wind Field: The user specifies arbitrary wind speed and direction. No variation of wind speed and direction with height is allowed, and a uniform, constant (steady state) wind is assumed.

Vertical Wind Speed: This is assumed to be equal to zero.

Horizontal Dispersion: The model uses a semiempirical /Gaussian plume, and the user specifies which of six stability classes to be used. Turner (1964). For distances less than 300 m empirically derived dispersion parameters are used. Rao et al. (1980). In the level-grade mode, the initial value of the dispersion coefficient is twice the value for the initial vertical dispersion coefficient. In the cut-section mode, the initial value of the dispersion coefficient is approximated as a function of the wind speed.

Vertical Dispersion: The model uses a semiempirical/Gaussian plume in which the user specifies stability class. Dispersion coefficients used are from Turner (1969). For distances less than 300m, dispersion coefficients from Rao et al. (1980), are used. In the level-grade mode, the initial σ_z is a function of the crossroad wind component with a maximum value of 3.57 m and a minimum value of 1.5 m. In the cut-section mode the initial dispersion parameter is a function of wind speed.
Chemistry Reaction Mechanism: This is not treated.
Physical Removal: This is not treated.
Background: This is not treated.

Lines of source code:	1298
Number of subroutines:	4
Input requirements:	

Initial setup and calibration needs are (1) in both batch and interactive mode discharges for vehicular line sources are input into the program; (2) meteorological data: wind speed, wind direction, stability class, mixing height and, (3) ambient air concentration measurments. For verification of the mode, meteorological data and ambient air concentrations are needed.

Output format:	Output from the model includes a printout of the 1-hour average concentration at each receptor.
Load module storage:	8K core
User manual:	yes
Systems documentation:	yes
Date of first version:	1980
Date of latest documents:	1980
Machine interface:	Batch, interactive
User support:	yes
Analytical features for model:	air quality
Reactive pollutant:	no
Nonreactive pollutant:	yes
Physical loss out of element:	no
Variable wind speeds:	yes
Variable wind direction:	yes
Variable inversion base height:	yes
Variable reactive pollutants:	no
Variable incident sunlight:	no
Point sources:	no
Linear sources:	yes
Area sources:	no
Complex topography:	no
Simple topography:	yes
Vertical pollutant dispersion:	yes
Crosswind pollutant dispersion:	yes

Multielement interactive:	no
Single element:	yes
Simultaneous pollutant introductions:	yes
Regional and sub-continental:	no
Localized:	yes
Time scale: Hours:	yes
Time scale: Days:	no
Time scale: Years:	no

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Model acronym:	ISC
Model name:	Industrial Source Complex Model
Sponsor:	(Organization or person sponsoring development): USEPA Source Receptor Analysis Branch, Office of Air Quality Planning and Standards
Developer:	(Organization or person designing code): H.E. Cramer Company, Inc.
Contact:	(Organization or person administering distribution): Joseph A. Tikvart
Contact address:	USEPA Off. of Air Quality Pollution Standards Mail Drop 14, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-5261
Availability:	(Public/Proprietary, Purchase/Lease, Cost): (See Aprac - 1A)
Type of model:	Air
Summary:	Short-and long-term concentration estimates from industrial source complexes.

Abstract:

The Industrial Source Complex (ISC) Dispersion Model is a Gaussian plume model used to evaluate the air quality impact of emissions from industrial source complexes. The ISC Model consists of two computer programs, one for short-term analyses and one for long-term analyses. The short-term model program, ISCST, uses sequential hourly meteorological data to estimate concentration or deposition patterns from 1 hour to 1 year. The long-term model program, ISCLT, uses statistical wind summaries to estimate seasonal and annual concentration or deposition patterns. The ISC Model has rural and urban options. Major features of the ISC Model program are: (1) effects of aerodynamic building wakes and stack tip downwash; (2) effects of variations in terrain height; (3) plume rise due to momentum and buoyancy as a function of downwind distance; (4) dispersion of emissions from stack area, line and volume sources where line sources are simulated by multiple-volume sources; (5) physical separation of multiple sources; (6) time-dependent exponential decay of pollutants; and (7) effects of gravitational settling and dry deposition. The number of sources and receptors are interdependent; however, 300 is the maximum number of sources accepted, arbitrarily located. Receptors can be specified on a polar or rectangular grid and Briggs' early plume rise formulations, including the momentum terms, are used. Deposition can be calculated or allowed for only over flat terrain. The short-term program calculates values of average concentration or deposition for time periods of 1, 2, 3, 4, 6, 8, 12 and 24 hours. Additionally, the ISCST may be used to calculate N-day concentration or deposition values where the maximum value of N is 366 days. The units option allows the user to specify the imput emissions units and/or output concentration or deposition units. Applications that do not require at least one of the ISC Model features should utilize a less comprehensive computer model.

Document citations:

Industrial Source Complex (SC) Dispersion Model User's Guide, Volume I, NTIS # PB 30-133-044.

Industrial Source Complex (ISC) Dispersion Model User's Guide, Volume II (Appendices A through I), NTIS # PB-30-133-051. Magnetic Tape of programs NTIS # PB 30-133-036.

Validations: OAQPS reviewed and approved.

Assumptions:

Meteorological homogeneity is assumed following the conversion of surface wind speed to that at plume height. All plumes remain level, regardless of terrain elevation, unless significant terminal fall velocity is specified. Emission rates can be varied according to specified meteorological classes or as a function of time (hour of day, season or month or both). A simple time-dependent exponential decay of the pollutant is optional.

Current implementation:	Mainframe computer.
Feasible implementation:	IBM or CDC with little or no modification.
Current hardware:	Mainframe Univac 1110
Software language(s):	Short-term: FORTRAN IV: Long-term: FORTRAN V &
Word size(s):	ASCII; 36-bit; minimum of 32-bit/word and minimum of 4 character bytes/word
Lines of source code:	Short-term 2756; Long-term 3503
Number of subroutines:	Short-term 9; Long-term 15

Input requirements:

For ISCST, meteorological data required are mean wind speed and measurement height; average random flow vector, wind profile exponents, ambient air temperature, height of mixing layer, Pasquill stability, and vertical potential temperature gradient. These data may be input directly using the same preprocessed meteorological data tape as the CRSTER Model or alternatively input by card deck. For ISCLT, joint frequencies of occurrence of wind direction and stability are required. Source data consist of emission rate (total emissions for deposition); dimensions of stack, building area or volume source; effluent characteristics; surface reflection coefficients for each settling-velocity category; receptor data; and receptor terrain elevation data. Default values are available for any combination of sources at all receptors for any specified day(s) or time period; highest and second highest such values; a maximum of 50 such values. ISCLT output provides input source-receptor and meteorological data listings; long-term mean concentration or deposition values calculated at each receptor for each source and for combined emission sources; contributions of individual sources to the maximum 10 such values calculated for the combined emission sources or as contributed to user-specified receptors.

User Manual:	yes
Systems documentation:	yes
Date of latest documentation:	1979
Machine interface:	batch
Learning difficulity:	medium-high
User support:	yes
Analytical features for Model:	air quality
Reactive pollutant:	no
Nonreactive pollutant:	yes
Physical loss out of element:	yes
Variable wind speeds:	yes
Variable wind direction:	yes
Variable inversion base height:	yes

Variable reactive pollutants:	no
Variable incident sunlight:	no
Point sources:	yes
Linear sources:	yes
Area sources:	yes
Complex topography:	no
Simple topography:	yes
Vertical pollutant dispersion:	yes
Crosswind pollutant dispersion:	yes
Multielement interactive:	no
Single element:	yes
Simultaneous pollutant introductions:	yes
Regional and sub-continental:	no
Localized:	yes
Time scale: Hours:	yes
Time scale: Days:	yes
Time scale: Years:	yes
Decay term may be input by user as well	yes
As settling velocities for deposition	

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Model acronym:	LIRAQ
Model name:	Livermore Regional Air Quality Model
Contact:	J.E. Penner, M.C. MacCracken, J.J. Walton, J. Shreffler
Contact address:	Lawrence Livermore Lab, Livermore, CA 94550; Jack Shreffler, US EPA Environmental Sciences Research Lab, Research Triangle Park, NC 27711
Contact telephone:	(415) 422-1800/(919) 541-4524
Availability:	Program presently exists only at Lawrence Berkley and Lawrence Livermore Labs
Type of model:	Air
Summary:	Single level Enderian grid model estimates regional distributions of pollutants.

Abstract:

The Livermore Regional Air Quality Model (LIRAQ) exists in two versions, LIRAQ-1 and LIRAQ-2. Both versions are two-dimensional (horizontal) Eulerian grid models designed to predict regional distributions of air pollutants. LIRAQ-1 can treat up to four noninteracting or simply interacting species on up to a 45 x 50 grid. It uses the flux-corrected algorithm to treat transport. LIRAQ-2 simulates evolution of the concentrations of 12 chemically interacting species on a 20x 20 grid. It uses an upstream differencing scheme to represent horizontal transport and the Gear package to carry out time integration. A version with chemistry update to 1980 is now being tested.

Both versions of the model provide graphical and tabular displays of selected species over the entire grid, and graphical displays of the temporal variability of selected species at up to 50 selected grid elements. Edit intervals are as specified and can be varied at the user's convenience. Extensive graphical capabilities are built into the code, and all input quantities are echoed in tabular output. Temporal and spatial variations of emissions, mixing depth, winds, solar flux, and spatial variations of terrain are treated.

Document citations:

MacCracken, M.C., et al., "The Livermore Regional Air Quality Model: Concept and Development," J. Appl. Meteorol., 17, 254-272, 1978.

MacCracken, M.C., et al., User's Guide to the LIRAQ Model: An Air Pollution Model for the San Francisco Bay Area, Lawrence Livermore Laboratory, Livermore, CA, December 1975.

Duewer, W.H., et al., "The Livermore Regional Air Quality Model: II. Verification and Sample Application in the San Francisco Bay Area," J. Appl. Meteorol., 17, 273-311, 1978.

Duewer, W.H., et al., Livermore Regional Air Quality Model (LIRAQ) Transfer to EPA, Lawrence Livermore Laboratory Report UCRL-52864, 1980. (Available from NTIS) (Also to be published by EPA).

Abaq et al., Application of Photochemical Models: Volume I: The Use of Photochemical Models in Urban Ozone Studies, EPA Report 450/4-79-021, 1979.

Principal users:

Both LIRAQ models have been used by the San Francisco Bay Area Air Pollution Control District and the Association of Bay Area Governments in the preparation of the long-term Air Quality Maintenance Plan for the San Francisco Bay area. The U.S. Environmental Protection Agency has included LIRAQ-2 as part of their model validation exercise using data gathered during the RAPS program. Processors necessary to make the EPA database LIRAQ-compatible have been developed. C.D. Craig of Oregon State University is currently involved in a program to use LIRAQ-1 to model the air quality impact of agricultural burning in the Willamette Valley.

Validations: Medium

Assumptions:

Both of the LIRAQ models are 2-D horizontal models bounded on the top by a temporally and spatially varying inversion "lid." Both models assume a logarithmic concentration profile in the vertical based on a balance of fluxes at the boundaries which can be different for each species. This vertical profile is assumed to interact with the power law wind profile in determining horizontal transport. LIRAQ-2 does not compensate for the effects of the vertical distribution of pollutants in calculating transformation by chemical reactions. LIRAQ-2 uses a chemical reaction mechanism of some complexity but uses an approximate "lumping" scheme in treating hydrocarbon emissions and other reactive organic species. Although developed with the intention of maintaining the maximum fidelity to real chemical data compatible with the model, the chemical mechanism is, in part, a simulation mechanism. The present version of LIRAQ-1 assumes no chemical interactions other than a deposition velocity and/or exponential decay.

Current implementation: Mainframe computer
Current hardware: Mainframe CDC 4600
Software language(s): FORTRAN IV
Word size(s): 60-bit
Input requirements:

(1) A file specifying the topographic elevation at every grid point in the model domain, as well as any map information (rivers or shore outlines, city or station locations) to be displayed on the output.

(2) Files specifying the emissions in each grid element at hourly intervals.

(3) Files giving data fields on mass consistent vertical (through the inversion) and horizontal fluxes, inversion base heights (i.e., mixing depths), atmospheric transmissivity (based on cloud extent), and horizontal

and vertical eddy diffusivities. These files are normally supplied by a meteorological data processing code, MASCON, but could be provided by other processing routines.

(4) A file giving photodissociation rates as a function of solar zenith angle for a clear sky (LIRAQ-2 only).

(5) A file giving observed species concentrations at measuring stations to be used for initializing the problem.

(6) A file defining the particular problem to be run (i.e., title, start time, stop time, species and locations for graphical output, boundary conditions, molecular weights and specific emissions factors for various species).

Output format:

(1) Voluminous printer files echoing all input and providing species concentrations at the surface and averages for mixed layer at all grid locations at every edit interval.

(2) A file containing concentrations for selecting species at selected locations as a function of time.

(3) A file containing information about the numerical integration scheme.

(4) Voluminous graphical output as described above.

User manual:	Yes
Systems documentation:	Yes
Date of latest documents:	1980
Continued enhancement:	Yes
Analytical Features for Model:	Air Quality
Reactive pollutant:	Yes
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	Yes
Variable incident sunlight:	Yes
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	See (1)

Crosswind pollutant dispersion:	See (1)
Multielement interactive:	Yes
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	Yes
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	Yes (1 hr. concentrations primarily for single-day simulation)
Time scale: Years	No

(1) A logarithmic profile in vertical based on balance of fluxes.

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Model acronym:	LPAQSM
Model name:	Lagrangian Photochemical Air Quality Simulation Model
Developer:	Environmental Research and Technology, Inc. (ERT)
Contact:	Jack Shreffler
Contact address:	US EPA Environmental Research Lab, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4524
Type of model:	Air
Summary:	Predicts the concentration of ozone produced in an urban area.

Abstract:

LPAQSM is designed to predict the concentrations of ozone produced in an urban area by modeling the emissions, transport and transformations in the presence of ultraviolet radiation.

The model is designed for simulation between sunrise and sunset on a single day. It has five levels of vertical resolution but describes only one area of an urban domain at a particular time. Concentrations are output for each 30 minutes along the trajectory.

Document citations:

A Lagrangian Photochemical Air Quality, Simulation Model Vol. I, Model Formulation Vol. II, User's Manual EPA-600/8-79-015a.b.

Principal users:	ERT and EPA
Validation:	Not reviewed by OAQPS
Assumptions:	

The model assumes a Lagrangian parcel of air of dimensions typically 5 x 5 km by 1.5 km high. The parcel moves with wind, entraining emissions which enter into the photochemical reactions. Initial leading of pollutants is specified, and the parcel has a rigid upper boundary and no lateral diffusion.

Current implementation:	Mainframe computer
Current hardware:	Mainframe UNIVAC 1110
Software language(s):	FORTRAN
Word size(s):	36-bit
Input requirements:	

Emissions inventory for hydrocarbons, nitrogen oxide; surface network air quality and meteorological measurements; upper air radiosonde data; solar radiation data.

Input databases:	Regional Air Pollution Study (RAPS-St. Louis) database is being used.

Output format:

Output is in the form of computer printout. Concentrations of ozone, carbon monoxide, sulfur dioxide, hydrocarbons and nitrogen oxides are supplied at 30-minute intervals for 5 levels in the vertical.

Load module storage:	60,000 words
User manual:	Yes
System documentation:	Yes
Latest documentation:	1979
Analytical Features for Model:	Air Quality
Reactive pollutant:	Yes
Nonreactive pollutant:	No
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable reactive pollutants:	Yes
Variable incident sunlight:	Yes
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Crosswind pollutant dispersion:	No
Multielement interactive:	Yes
Single element:	No
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	Yes
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No

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Model acronym: MODHIWAY
Model name: Modified HIWAY Program
Contact: Lewis H. Nagler
Contact address: EPA/NOAA-Air Facilities Branch, EPA Region 4, Atlanta, GA 30308
Contact telephone: (404) 881-2786
Type of model: Air
Summary: EPA's HIWAY model modified for more than one roadway.

Abstract:

EPA's HIWAY model was modified to allow for calculation to be made for more than one roadway at a time. This allows for computation of pollutant concentrations due to intersecting roads (e.g., intersections).

Document citations:

User Information for the Modified HIWAY Program, EPA Information Clearinghouse files.

User's Guide for HIWAY, EPA 650/4-74-008, NTIS PB 239-944/AS

Validation: OAQPS has neither reviewed nor approved this model.
Assumptions: Same as HIWAY
Current implementation: Mainframe computer
Current hardware: Mainframe UNIVAC 1110
Software language(s): FORTRAN V
Word size(s): 36-bit
Input requirements:

Differs from HIWAY to the extent that coordinates for more than one roadway (and associated parameters) can be used.

Output format:

Outputs concentrations in parts per million (ppm), milligrams per cubic meter (mg/m^3) and micrograms per cubic meter ($\mu g/m^3$), as well as giving grid concentrations and road segment end points in a format suitable for a graphic plotter.

Load module storage: 12K core
User manual: Yes
Analytical features for model: Air Quality
Reactive pollutant: No
Nonreactive pollutant: Yes
Physical loss out of element: No
Variable wind speeds: Yes
Variable inversion base height: Yes

Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	No
Linear sources:	Yes
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days	No
Time scale: Years	No

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Model name:	**Modified Cramer-Gaussian Equation**
Developer:	Air Force Rocket Propulsion Laboratory, Edwards AFB
Contact:	Major Bielicki
Contact address:	Det 21, 2WS Stop 228, Edwards AFB, CA 93523
Contact telephone:	(805)277-4507
Type of model:	Air

Abstract:
The Modified Cramer-Gaussian equation is used for large (2-44 ton) vertically fired state rocket motor firings. This model was developed and verified at AFRPL, using data from 18 tests in which the motor is fired vertically upward-the normal configuration for the large motor tests. The model assumes a Gaussian distribution with the plume traveling with the mean wind.

Document citations:	Verification Study of Rocket Exhaust Gas Diffusion Model Final Report AFRPL-TR-79-96
Principal users:	Air Force - AFRPL Edwards Air Force Base

Assumptions:

Assumes a Gaussian distribution with the plume traveling with the mean wind. The equation was verified for only quasi-instantaneous vertical rocket motor firings at AFRPL and is therefore site specific. Initial plume radius is computed using an equation developed by linear regression analysis of test data and is also site specific.

Input requirements: Amount released, wind speed shear sfc-hs, mean wind speed sfc-hs, change in wind direction sfc-hs, initial plume radius, height of stabilized cloud (hs), standard deviation of wind direction at 200 feet.

Output format: Concentration at any X_1 Y_1 and Z point.

Geographic area: Developed on data from AFRPL.

Analytical Features for Model: Air Quality

Reactive pollutant:	No		
Nonreactive pollutant:	Yes	Localized:	Yes
Physical loss out of element:	No	Time scale: Hours:	Yes
Variable wind speeds:	Yes	Time scale: Days:	No
Variable wind direction:	Yes	Time scale: Years:	No
Variable inversion base height:	No	Wind speed shear, standard deviation of wind direction:	Yes
Variable reactive pollutants:	No	Single element:	Yes
Variable incident sunlight:	No	Simultaneous pollutant introductions:	No
Complex topography:	No	Regional and subcontinental:	No
Simple topography:	Yes		
Vertical pollutant dispersion:	Yes		
Crosswind pollutant dispersion:	Yes		
Multielement: interactive:	No		

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Model name:	**Mountain Iron Diffusion Equation**
Developer:	Pacific Northwest Laboratory, Battelle
Contact telephone:	Cpt. Darryl Dargitz Detachment 30, 2d Weather Squadron (MAC) Vandenberg Air Force Base, CA 93437
Contact telephone:	276-8682
Type of model:	Chemical Spills
Summary:	Statistical diffusion prediction equation based on field tracer release program.

Abstract:

The mountain iron diffusion equation was developed from the results of a field tracer release program conducted at South Vandenberg. The equation is composed of down wind distance, normalized concentration, standard deviation of wind direction, vertical temperature difference, and mean wind speed.

Document citation:	**The Mountain Iron Diffusion Program: Phases 1 and 2, Vol. 1,2,3, AFWTR-TR-67-1, BNWL-572, 1967-69.**
Assumptions:	The equation was derived from empirical data collected at a specific site. Surface releases applicable only to continuous ground-level nonbouyant releases. Distances to about 10 miles.
Current implementation:	Handbook; Programmable Calculator
Current hardware:	TI-59
Input requirements:	Release rate, standard deviation of wind direction, vertical temperature difference, mean wind speed.
Output format:	Either distance or concentration
User manual:	Yes
Learning difficulty:	Low
Output interpretation:	Low
Geographic area:	Developed with data from south Vandenberg
Analytical Features for Model:	Air Quality

Reactive pollutant:	No	Crosswind pollutant dispersion:	Yes
Nonreactive pollutant:	Yes	Multielement: interactive:	No
Physical loss out of element:	No	Single element:	Yes
Variable wind speeds:	Yes	Simultaneous pollutant introductions:	No
Variable wind direction:	No	Regional and sub-continental:	No
Variable inversion base height:	No	Localized:	Yes
Variable reactive pollutants:	No	Time scale: Hours:	Yes
Variable incident sunlight:	No	Time scale: Days:	No
Point sources:	yes	Time scale: Years:	No
Linear sources:	No	Vertical temperature difference:	Yes
Area sources:	No	Standard deviation of wind direction:	Yes
Complex topography:	Yes		
Simple topography:	No		
Vertical pollutant dispersion:	Yes		

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Model acronym:	MPTER
Model name:	Multiple Point Gaussian Dispersion Algorithm with Optional Terrain Adjustment
Sponsor:	US EPA Environmental Sciences Research Laboratory Office of Research and Development
Developer:	Same as above
Contact:	Tom Pierce, Bruce Turner
Contact address:	US EPA Environmental Sciences Research Lab Davis Drive Research Triangle Park, NC 27711
Availability:	(see APRAC-1A)
Type of model:	Air
Summary:	Estimates concentrations from multiple point sources in rural environments with slight terrain variations.

Abstract:

MPTER is a multiple point source Gaussian model with optional terrain adjustments. MPTER estimates concentrations on an hour-by-hour basis for relatively inert pollutants (i.e., sulfur dioxide and TSP). MPTER uses Pasquill-Gifford dispersion parameters and Briggs plume rise methods to calculate the spreading and the rise of plumes. The model is most applicable for source-receptor distances less than 10 kilometers and for locations with level or gently rolling terrain. Terrain adjustments are restricted to receptors whose elevation is no higher than the lowest stack top. In addition to terrain adjustments options are also available for wind profile exponents, buoyancy-induced dispersion, gradual plume rise, stack downwash and plume half-life.

Document citations:

Pierce, T.E. and Turner, D.B., User's Guide for MPTER: A Multiple Point Gaussian Dispersion Algorithm with Optional Terrain Adjustment, EPA-600/8-80-016, U.S. Environmental Protection Agency, Research Triangle Park, NC, 1980.

U.S. Environmental Protection Agency, MPTER tape, (Computer programs on tape containing programs and PTPLU screening model) NTIS PB 30-168156, National Technical Information Service, Springfield, VA, 1980.

Principal users:	To be used by various agencies in assessing National Ambient Air Quality Standard for SOz or TAP.
Validations:	OAQPS has reviewed and approved.

Assumptions:

AMPTER is based upon Gaussian dispersion theory using mean meteorology conditions on an hour-by-hour basis. Dispersion coefficients used to calculate both vertical and horizontal spreading are those of Pasquill and Gifford. The rising plume is assumed to completely reflect off the top of the mixing height in neutral and unstable conditions. The plume rise is based on Briggs. MPTER can also optionally consider stack downwash, buoyancy-induced

dispersion and gradual plume rise. MPTER can either utilize constant emission rates or hourly emission rates for each point source. The emitted pollutants should be relatively inert chemically since MPTER does not consider complex physical removal or chemical reaction processes. User can approximate exponential decay of a pollutant by supplying a half-life. Wind speeds are extrapolated to stack top using user-supplied wind profile exponents. The optional terrain adjustment reduces the plume height relative to the ground. Additional terrain adjustment factors can be entered which control the proportion of terrain adjustment.

Current implementation:	Mainframe computer
Current hardware:	Mainframe IBM 360, CDC 6600, UNIVAC 1100/82
Software language:	FORTRAN
Word size(s):	32-bit, 60-bit
Lines of source code:	2448
Number of subroutines:	7

Input requirements:

Input for MPTER includes: control data, emission data, receptor information, and hourly met data. The hourly met data can be read either off cards or from a disk tape preprocessed from NCC surface/upper-air observations. Hourly emission data can optionally be input from disk/tape.

Input databases: NCC surface/upper-air observations.

Output format:

The variety of MPTER options allow the user to output to a printer, or to write to tape, information required for a multitude of applications. Tape/disk files can be written containing hourly concentrations for each receptor for all sources, concentrations for user-specified averaging period. MPTER allows even more flexibility on printed output. The range of options includes printout for the highest five concentrations for each receptor to printout for hourly contributions from each source at each receptor.

Load module storage:	48K core, Univac 1110
User manual:	Yes
Systems documentation:	Yes
Date of first version:	1980
Date of latest document:	1980
Machine interface:	Batch
Learning difficulty:	Medium-low
Output interpretation:	Low-medium
User support:	Yes
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes

Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days	Yes
Time scale: Years	Yes
Exponential decrease with user input half-life:	Yes

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Model name:	**Ocean Breeze and Dry Gulch Equation**
Sponsor:	Atomic Energy Commission
Developer:	Air Force Cambridge Research Lab.; Hartford Lab.; General Electric Company
Contact:	Captain Darryl Dargitz
Contact address:	Detachment 30, 2nd Weather Squadron (MAC) Vandenberg Air Force Base, CA 93437
Contact telephone:	276-8682
Type of model:	Chemical Spills
Summary description:	Statistical diffusion prediction equation based on experimental field tests.

Abstract:

The diffusion prediction equation is a quantitative statement of the relationship between the diffusive power of the atmosphere as indicated by concentrations of maternal downwind from a source, and the purely meteorological quantities which characterize the turbulent diffusion process in the atmosphere. Linear multiple regression techniques were utilized to develop the statistical diffusion prediction equation which is composed of normalized peak concentration, downwind travel distance, standard deviation of wind directions in degrees of azimuth and the vertical temperature difference. Evaporation rates for various hypergolic rocket propellants have been added to the basic equation.

Document citations:

The Ocean Breeze and Dry Gulch Diffusion Program, Report AFCRL-63-791, Vol. I and II.

The Evaporation and Dispersion of Hydrazine Propellants from Ground Spills, CEEDO-TR-78-30.

Principal users:	Air Force
Assumptions:	Equation derived from empirical data on limited scale of less than 10 km. Tracer releases simulating ground-level continuous point sources.
Current implementation:	Handbook, Programmable
Current hardware:	Packard Bell PB 250; TI-59
Word size(s):	23-bit
Input requirements:	Release rate of source strength, vertical temperature deviation, standard deviation horizontal wind direction and either concentration or concentration.
Output format:	Either distance or concentration
User manual:	Yes
Learning difficulty:	Low
Output interpretation:	Low
Geographic area:	Formulated with data from Vandenberg and Cape Canaveral (Kennedy), but used elsewhere.
Analytical Features for Model:	Air Quality

Reactive pollutant:	Yes
Phyiscal loss out of element:	No
Variable wind speeds:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No
Vertical temperature difference:	Yes
Standard deviation of wind direction:	Yes

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Model acronym:	OZIPP
Model name:	Kinetics Model and Ozone Isopleth Plotting Package
Contact:	Gerald L. Gipson
Contact address:	US EPA Office of Air Quality Planning and Standards Monitoring and Data Analysis Division, MD-14, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-5488
Type of model:	Air
Summary:	Calculates and plots isopleth diagram of maximum 1 -hour average ozone concentrations.

Abstract:

The Kinetics Model and Ozone Isopleth Plotting Package (OZIPP) computer program can be used to simulate ozone formation in urban atmospheres. OZIPP calculates maximum 1-hour average ozone concentrations given a set of input assumptions about initial precursor concentrations, light intensity, dilution, diurnal and spatial emission patterns, transported pollutant concentrations and reactivity of the precursor mix. The results of multiple simulations are used to produce an ozone isopleth diagram tailored to particular cities. Such a diagram relates maximum ozone concentrations to concentrations of nonmethane organic compounds and oxides of nitrogen, and can be used in the Empirical Kinetic Modeling Approach (EKMA) to calculate emission reductions necessary to achieve air quality standards for photochemical oxidants.

Document citations:

Kinetics Model and Ozone Isopleth Plotting Package (OZIPP), EPA-600/8/7700146b, U.S. Environmental Protection Agency, Research Triangle Park, NC, July 1978.

Whitten, G.Z. and Hugo, E., User's Manual for Kinetics Model and Ozone Isopleth Plotting Package, EPA-600/8-78-014a, U.S. Environmental Protection Agency, Research Triangle Park, NC, July 1978.

Uses, Limitations, and Technical Basis of Procedures for Quantifying Relationships Between Photochemical Oxidants and Precursors, EPA-450/2-77-021a, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1977.

Principal users:

The OZIPP Model has been used to generate ozone isopleth diagrams to calculate emission reductions necessary to achieve the ambient air quality standard for ozone. The model was used by state/local air pollution control agencies as the basis for estimating emission reductions for the 1979 submittal of the State Implementation Plans.

Validation: Reviewed and approved by OAQPS

Assumptions:

The model underlying OZIPP is similar in concept to a trajectory-type photochemical model which simulates the formation of ozone from precursors within a migrating column of air. A column of uniformly mixed air extends from the earth's surface throughout the mixed layer. The height of the column rises according to the diurnal variation in mixing height, resulting in dilution of pollutants within the column and entrainment of pollutants which were initially above the column. As the column moves, emissions of fresh precursors are encountered. The model mathematically calculates the formation of ozone within the column as a function of time in accordance with a chemical kinetic mechanism. The model employs a gear-type integration scheme to solve numerically the set of differential evaluations which describe the model assumptions. To generate an ozone isopleth diagram, the model performs repeated simulations with differing pollutant levels initially within the column. Using the results of these simulations, a diagram is constructed which expresses initial precursor concentrations. The program incorporates a hyperbolic spline interpolation scheme to construct the graph. These diagrams are based on mathematical simulations of ozone formation occurring during a day. As such, the model is limited in applicability to ozone problems within or immediately downwind of urban areas and cannot consider the following: (1) rural ozone problems, (2) ozone problems occuring in the early morning or at night, and (3) contributions of single or small groups of sources to ozone problems. The OZIPP model is best used to study the effectiveness of areawide control stragegies in reducing peak, 1-hour average ozone concentrations within or downwind of a city.

Current implementation:	Mainframe computer
Current hardware:	Mainframe Univac 1100
Software language(s):	FORTRAN
Word size(s):	36-bit

Input requirements:

Data are supplied to the model to make an ozone isopleth diagram specific to a particular city. These data include: latitude, longitude and time zone of the city; the day, month and year; the minimum morning and maximum afternoon mixing heights; sets of emission fractions which reflect the effect of precursor emissions occurring throughout the day; and the concentrations of ozone and precursor transported into the city. Additional input parameters are supplied to control the generation of the ozone isopleth diagram (e.g., scale of the diagram, size of the diagram, accuracy, interpolation smoothing, etc). All input data are processed in a simple manner, and no extensive computerized database is required.

Output format:

The primary output of the model is the ozone isopleth diagram. The diagram is depicted on a line printer plot and can be generated as an option on a CALCOMP Plotter. A report is also produced which summarizes the input data and results of the simulations that were performed to generate the diagram.

User manual:	Yes
Systems documentation:	Yes
Date of latest document:	1978
Analytical Features for Model:	Air Quality
Reactive pollutant:	Yes
Nonreactive pollutant:	No
Variable inversion base height:	Yes
Variable reactive pollutants:	Yes
Variable incident sunlight:	Yes
Point sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Multielement interactive:	Yes
Single element modeling:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	No
Localized:	Yes
Time scale: hours:	Yes
Time scale: days:	No
Time scale: years:	No

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Model acronym:	P23A, P23B
Model name:	A, Effective Plume Rise, B, Ground-Level Concentration of Pollutants
Developer:	McClintock Corp.
Contact address:	McClintock Corp., 7000 SW, 62nd Avenue, Box 430980, Miami, FL 33143
	Purchase, $135
Type of model:	Air
Summary:	Calculates effective stack height and ground-level concentration of pollutants.

Abstract:

P23A calculates for any given atmospheric stability class the maximum plume rise for a buoyancy-dominated plume and for a momemtum-dominated plume. The higher of those two values is added to the physical stack height to determine the effective stack height used as input by P23B. The average windspeed at the physical stack height is also calculated.

The P23B program calculates first the standard deviation of horizontal concentration distribution σ_y and the standard deviation of vertical concentration distribution σ_z for a given stability class and downwind distance from the source. Handles both urban and rural situations,automatically.

The time-averaged standard deviation of horizontal concentration distribution σ_{yt} can be calculated by the program for receptors open for any period of time (up to 24 hours).

After performing the standard deviation calculations, the program calculates the ground-level concentration of pollutant,given the following data:

A. Effective stack height (calculated by Program P23A)
B. Crosswind distance
C. Emission rate
D. Average windspeed at the physical stack height (calculated by Program P23A).

Document citations:

Porter, R.A., Gaussian Dispersion Equation Solutions by Calculator with Urban/Rural Coefficients.

Assumptions:

Model uses power law determination of wind speed at soucee/height, Bigg's plume rise equations and Gaussian solution for the ground level concentration for a point source. Time-averaged concentrations are calculated using time-averaged standard deviations obtained from peak-to-mean ratios for the various averaging times up to 24 hours.

Current implementation:	Programmable caclulator
Current hardware:	TI-59 Calculator, with or without PC-100 printer

Input requirements:	Source characteristics exit temperature, stack diameter, exit velocity, stack height, ambient temperature, windspeed, stability.
Output format:	Wind speed at physical source height, effective stack height, pollutant concentration.
User manual:	Yes
Learning difficulty:	Low
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement: interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours	Yes
Time scale: Days:	No
Time scale: Years:	No
Variable, stability:	Yes

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Model acronym:	PAL
Model name:	Point, Area, Line Source Algorithm
Sponsor:	U.S. EPA Environmental Sciences Research Laboratory Office of Research and Development
Developer:	same as above
Contact:	D. Bruce Turner
Contact address:	EPA Environmental Sciences Research Lab Mail Drop 80 Research Triangle Park, NC, 27711
Contact telephone:	(919)541-4564
Availability:	(see APRAE-1A)
Type of model:	Air
Summary :	Estimates short-term dispersion for point, area, and line sources.

Abstract:

Point, Area, Line source algorithm. This short-term Gaussian steady state algorithm estimates concentrations of stable pollutants from point, area and line sources. Computations from area sources include effects of the edge of the source. Line source computations can include effects from a variable emission rate along the source. The algorithm is not intended for application to entire urban areas but for smaller scale analysis of such sources as shopping centers, airports, and single plants. Hourly concentrations are estimated and average concentrations from 1 hour to 24 hours can be obtained.

Document citations:

User's Guide for PAL, EPA-6--/4-78-013.

Turner, D.B., and Petersen, W.B., A Gaussian Plume Algorithm for Point, Area, and Line Sources, NATO/CCMS Sixth International Technical Meeting on Air Pollution Modeling and Its Application, V. 42: 185-228, 1975.

Source program available as part of UNAMAP (Version 3) PB 277 193, $420, NTIS, Springfield, VA 22161.

Level of Validation: OAQPS has not reviewed and approved this model.

Assumptions:

The following assumptions are made: 1) Dispersion from points, and area and line elements result in Gaussian distributions in both the horizontal and vertical directions through the dispersing plume from that point or element, and therefore steady state Gaussian plume equations can be used for point sources. 2) Concentration estimates may be made for each hourly period using the mean meteorological conditions appropriate for each hour. 3) The total concentration at a receptor is the sum of the concentrations estimated from all point and area sources, that is, concentrations are additive.

Current implementation:	Minicomputer ; Mainframe computer
Current hardware:	1) Mainframe UNIVAC 1110 2) VAX 11/780
Software language(s):	1) FORTRAN 2) FORTRAN IV-Plus
Word size(s):	2) 32-bit
Operating system(s):	2) VMS
Lines of source code:	3484
Number of subroutines:	8
Input requirements:	User must specify source types and provide meteorological data
Output format:	Output includes hourly and average (up to 24 concentrations at each receptor)
Source program storage:	43K core
User manual:	Yes
Systems documentation:	Yes
Date of latest version:	1978
Date of latest documents:	1978
Learning difficulty:	Medium
Output interpretation:	Low
User support:	Yes
Confidentiality:	Release to public.
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	Yes
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes

Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No

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Model acronym:	PBM
Model name:	Photochemical Box Model
Developer:	Modeling Sciences Section of EPA's Meteorology Division
Contact:	Kenneth L. Schere
Contact address:	US EPA Office of Research & Development, Envir. Sciences Research Lab, MD-80, Research Triangle Park, NC, 27711
Contact telephone:	(919) 541-4524
Type of model:	Air
Summary:	Stationary, single-cell photochemical air quality simulation model.

Abstract:

The Photochemical Box Model (PBM) is a stationary single-cell photochemical air quality simulation model (PAQSM) designed to simulate the concentrations of particular pollutant species with a well-mixed domain. Typically, the domain is centered on an urban area. The horizontal dimensions of the cell are on the order of 20-30 km and are temporally invariant while the vertical dimension of the cell changes to reflect the diurnally varying growth of the mixed layer above the earth's surface. The principal substances simulated by the PBM include carbon monoxide, nitrogen monoxide and dioxide, ozone, and five lumped-hydrocarbon classes: olefins, paraffins, aldehydes, aromatics, and nonreactives.

The processes of transport through the domain, entrainment from aloft, injection of source emissions through the bottom of the cell, and chemical transformations within it are modeled. The PBM is quite simple in comparison to other PAQSMs. It provides an hour-averaged measure of air quality taken as a spatially integrated average over the volume of the cell for each hour of simulation. Spatial resolution is not possible within the model's structure. The model considers emissions, the atmospheric chemistry of ozone formation, and advection. The chemical kinetic mechanism within the PBM contains 24 species participating in 36 reactions. The horizontal extent of the model domain enables only a portion of an urban area to be modeled at a time, and hence an entire urban airshed cannot be considered by the PBM. Typically, the domain encompasses the area where most of the emissions sources are concentrated. The model domain is on the order of 20 km x 20 km x 1.5 km in dimension and is considered to be a homogeneous volume of air. The meteorological situation of a prevailing stagnating anticyclone might be most conducive to application of the PBM.

Document citations:

Schere, K.L.,and Demerjian, K.L., A Photochemical Box Model for Urban Air Quality Simulation, in proceedings of the 4th Joint Conference on Sensing of Environmental Pollutants, New Orleans, LA, November 1977, pp. 427-433.

Demerjian, K.L., and Schere, K.L., Application of a Photochemical Box Model for O(3) Air Quality in Houston, TX, in proceedings of Ozone/Oxidants: Interactions with the Total Environment II, Houston, TX, October 1979, pp 329-352.

Principal users:

The Photochemical Box Model is an evolving PAQSM being developed by the Modeling Sciences Section of EPA's Meteorology Division. It has been used to model the air quality for St. Louis, MO., and Houston, TX. The model is currently undergoing evaluation and verification as part of the EPA Regional Air Pollution Study (RAPS) model validation program.

Validation: OAQPS has not reviewed.
Assumptions:

The PBM assumes a well-mixed model domain at all times and a homogeneous pattern of emissions sources across the bottom of the cell. The winds are assumed to fall into one of two categories: (1) very light and directionally variable or (2) above 2 m/s and directionally stable throughout the model simulation period. The rates of change of the modeled concentrations are described by a set of coupled ordinary differential equations that are solved numerically through a method developed by Gear.

Current implementation: Mainframe computer
Current hardware: Mainframe Univac 1100 or equivalent
Software language(s): FORTRAN
Word size(s): 36-bit

Input requirements:

The PBM requires various emissions, meteorological and air quality data to be preprocessed before the model can be executed. The emissions inventory must have hourly resolution and must include CO, NO(x) and five classes of organic hydrocarbons. The meteorological and air quality data are averaged over the available measurements. Some of the monitors should be located outside of the model domain to give an indication of the upwind boundary concentrations. The meteorological data include wind speed, wind direction, mixing height and photolysis rate constants and the air quality data include concentrations of NO(x), organics and O(3) at the beginning of the simulation and at the upwind boundary.

Output requirements:

The model provides a list of simulated concentrations for all species at ten-minute intervals during a model simulation. The current mixing height photolysis rate constants and wind speed are also printed out. Also, printer plots of the time series of predicted and observed (if available) concentrations are provided, as well as a summary of hour-averaged model predictions for principal species. The hour-averaged predicted and observed concentrations from a given simulation may be saved on disk storage at the user's discretion.

User manual: No
Date of latest documents: 1979
Continued enhancement: Yes

Analytical Features for Model:	Air Quality
Reactive pollutant:	Yes
Nonreactive pollutant:	No
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable incident sublight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	No
Crosswind pollutant dispersion:	No
Multielement, interactive:	Yes
Single element:	No
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	No
Localized:	Yes
Time scale: Hours	No
Time scale: Days	No
Time scale: Years	No

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Model acronym:	PENALTY
Model name:	S120 Noncompliance Penalty Model
Sponsor:	US EPA Office of Planning and Management
Developer:	Putnam, Hayes and Bartlett, Inc., Newton, MA
Contact:	Howard F. Wright
Contact address:	US EPA, Stationary Source Enforcement Division Office of General Enforcement, 401 M Street, SW, Washington, DC
Contact telephone:	(202) 755-0103
Type of model:	Air (Cost Benefit)

Abstract:

The Section 120 Noncompliance Penalty Model (PENALTY) is an economic model used to calculate the economic benefit of delayed compliance with the requirements of the Clean Air Act,as amended, August 1977. The noncompliance penalty is based on the concept that it is usually in a source's best economic interest to delay the commitment of funds for pollution control equipment, and that incentive should be eliminated.

Penalty compares two cash flows, that which the source would have experienced had it achieved compliance on the date it received a notice of noncompliance and that which it is estimated it will experience as a result of its delay. Because these cash flows occur at different times, a basis of comparision is provided by discounting them to their present value equivalents. The model then calculates the difference between these two cash flows and the appropriate quarterly payment schedule that the source should follow. It can also make a final adjusted penalty calculation when the source has achieved compliance. The capital investment portion of the penalty is calculated,using standard and rapid amortization. Under both types of amortization the program calculates the depreciation tax savings using straight line, sum-of-the-years-digits, and double declining balance depreciation methods. The program will automatically choose the method which will result in the lowest penalty.

Document citations:

Monday, July 28, 1980,Federal Register, Part II - EPA - Assessment and Collection of Noncompliance Penalties by EPA and approval of State Noncompliance Penalty Program, Appendix A - Technical Support Document Appendix 3 - CAA Section 120 Noncompl. Penalties Instruction Manual.

Principal users:

Model will not be used until effective date of Sec. 120 regs. 1/1/81, it will be used by HQ and regional offices,as well as sources and contractors, to compute noncompliance penalties.

Validation: Not reviewed nor validated by OAQPS.

Assumptions:

The relative mix of debt, preferred stock and common equity allocated to pollution control equipment is the same as that found in the firm's capital structure,as shown on its balance sheet. Cash flows are discounted using the equity method. The noncompliance penalty is computed as a nontax-deductible expense to the firm. Cash flows take place at the end of each month. The rate of inflation of pollution control operating and maintenance expenditures is the same as that for pollution control capital costs. The noncompliance penalty is calculated using a 30-year time horizon. The salvage value of any equipment with useful life remaining at the end of the 30-year time horizon is zero. The discount rate is not less than the inflation rate.

Current implementation:	Mainframe computer
Current hardware:	IBM 360/370
Software language(s):	FORTRAN
Word size(s):	32-bit
Input requirements:	

Input to the model includes source-related data: facility life, months of noncompliance, income tax rate, discount rate and preferred stock dividend rate; equipment-related data; capital expenditures, operating and maintenance costs, financing (industrial bonds; equity share, preferred stock share, and debt share of investment), equipment-useful life and depreciation life; and a forecasted inflation rate. This information may come from the firm itself as well as the Internal Revenue Service Chemical Engineering Plant Cost Inflation Index, the Federal Trade Commission, and Moody's Bond Record.

Output format:

Output consists of two user-selected formats: a lump sum settlement or a schedule of quarterly payments, both expressed in thousands of dollars.

User manual:	No
System documentation:	No
Date of first version:	Feb 1979

AD-A133 265 FEASIBILITY STUDY FOR AN AIR FORCE ENVIRONMENTAL MODEL AND DATA EXCHANGE..(U) GENERAL SOFTWARE CORP LANDOVER MD S MCKENZIE ET AL. JUL 83 AFESC/ESL-TR-82-13-VOL-4 2/4

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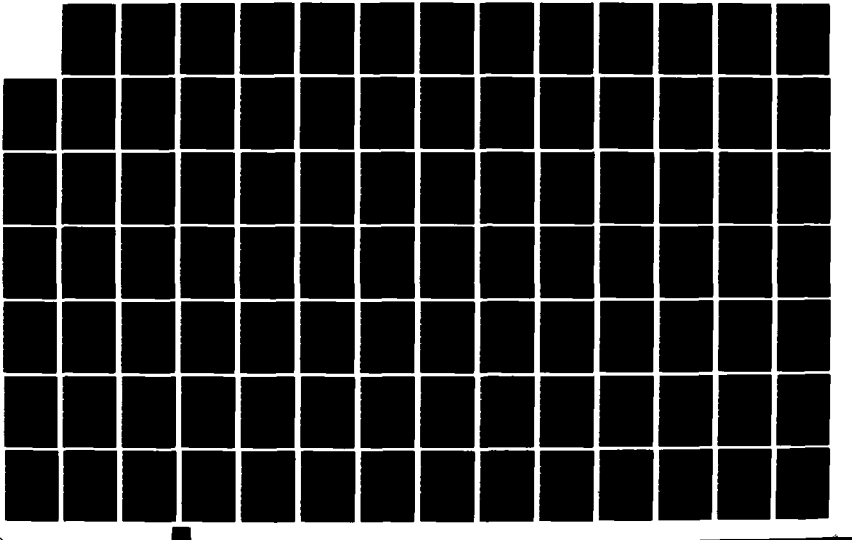

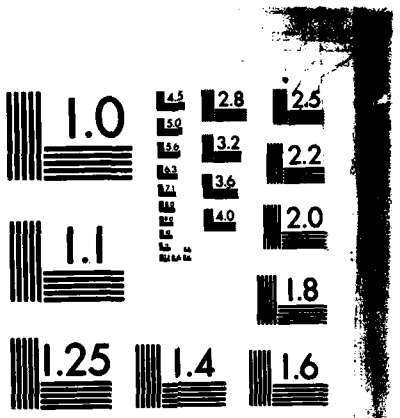

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Model acronym:	**PLUVUE**
Model name:	Plume Visibility Model
Sponsor:	EPA
Developer:	EPA
Contact:	James Dicke
Contact address:	EPA Off. of Air Quality Planning and Standards Research Triangle Park, NC 27711
Contact telephone:	(919) 549-5381
Type of model:	Air/Visibility
Summary:	Calculates visual range reduction and atmospheric discoloration from point source plume.

Abstract:

The design objective of the model is to calculate visual range reduction and atmospheric discoloration caused by the plumes consisting of primary particulates, nitrogen oxides, and sulfur oxides emitted by a single emissions source. The model is designed to predict the impacts of a single emissions source on visibility in Federal Class I areas. PLUVUE predicts the transport, atmospheric diffusion, chemical conversion, optical effects and sulfur deposition of point source emissions. The model uses the Gaussian formulation for transport and dispersion. The spectral radiance (intensity of light) at 39 visible wavelengths is calculated for views with and without the plume; the changes in the spectrum are used to calculate various parameters that predict the perceptibility of the plume and the contrast reduction caused by the plume. PLUVUE performs plume optics calculations in a plume-based mode and an observer-based mode. The model calculates four perception parameters useful for predicting visual impact: reduction in visual range, contrast of the plume against a viewing background at the 0.55 micrometer wavelength, the blue-red ratio (color shift) of the plume, and the color change perception parameter triangle E (Lab). Visibility impairment is caused by changes in light intensity as a result of light scattering and absorption in the atmosphere. Impairment can be qualified once the spectral light intensities or radiance has been calculated for the specific lines of sight of an observer at a given location in an atmosphere with known aerosol and pollutant concentrations. PLUVUE is a near-source plume visibility model, e.g., within 200 km of the source.

Document citations:

EPA, User's Manual For the Plume Visibility Model (PLUVUE). November 1980, EPA-450/4-80-032.

Latimer, D.A.,et al., The Development of Mathematical Models for the Prediction of Anthropogenic Visibility Impairment, EPA 450/3-78-110a,b,c, 1978.

Latimer, D.A., Power Plant Impacts on Visibility in the West: Siting and Emissions Control Implications, JAPCA Vol. 30, 1980, pp. 142-146.

Bergstrom, R.W., et al. Comparison of the Observed and Predicted Visual Effects Caused by Power Plant Plumes Symposium on Plumes and Visibility, November 10-14, 1980, to be published in Atmospheric Environment, 1981.

Principal users:	PLUVUE has been used by EPA primarily in a research mode and to provide estimates for hypothetical scenarios such as power plant siting impact.
Validations:	Not reviewed by OAQPS

Assumptions:

PLUVUE is based on Gaussian atmospheric dispersion assumptions, contains Briggs' plume rise equations, allows for surface deposition during the day and contains atmospheric chemistry modules that allow for conversion of nitric oxide to nitrogen dioxide and sulfur dioxide to sulfate aerosol. Scattering and absorption properties are calculated for particles and gases. For nitrogen dioxide the absorption at a particular wavelength is a tabulated function multiplied by the concentration. The effect of particle size on the wavelength dependence of the scattering coefficient and the phase function is calculated and the Mie equations are also solved. Calculation of light intensity follows from the radiative transfer equation.

Current Implementation:	Mainframe computer
Current hardware:	Mainframe Univac 1110
Software language(s):	FORTRAN
Word size(s):	36-bit

Input requirements: The input data required for PLUVUE include: wind speed aloft, stability category, lapse rate mixing depth, relative humidity, sulfur dioxide, nitrous oxides and particulate emission rates, stack gas parameters, stack gas oxygen content, ambient temperature, ambient nitrous oxides, nitrogen dioxide, ozone and sulfur dioxide concentrations, properties of background and emitted aerosols in two size modes, background visual range, deposition velocities for sulfur dioxide, nitrous oxides, course mode and accumulation mode aerosol, UTM coordinates and elevation of the source, UTM coordinates and elevation of the observer location.

Output format:

All runs have the data tables for the emissions source, meteorological and ambient air quality, and background radiative transfer. Plot files can also be written by PLUVUE. If a PLUVUE run is for either observer-based or plume-based calculations, either an observer-based or a plume-based plot file will be centered. These files are written on DISC storage units.

Load module storage:	25K
User manual:	yes
Systems documentation:	yes
Date of first version:	1978
Date of latest version:	1980
Date of latest documents:	1980
Analytical features for Model:	Air quality
Reactive pollutant:	yes
Nonreactive pollutant:	yes
Physical loss out of element:	yes
Variable wind speeds:	yes

Variable inversion base height:	yes
Point sources:	yes
Linear sources:	no
Area sources:	no
Complex topography:	no
Simple topography:	yes
Vertical pollutant dispersion:	yes
Crosswind pollutant: dispersion:	yes
Multielement interactive:	no
Single element:	no
Simultaneous pollutant introductions:	no
Regional and sub-continental:	yes
Localized:	yes
Time scale: Hours:	yes
Time scale: Years:	no
Variable stability category	yes

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Model acronym:	PTDIS
Model name:	PTDIS
Sponsor:	EPA
Developer:	EPA
Contact:	D. Bruce Turner
Contact address:	US EPA Environmental Sciences Research Lab., Mail Drop 80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	See APRAC-1A
Type of model:	Air
Summary:	Estimates short-term concentrations at user-defined distances from point source.

Abstract:

Estimates short-term concentrations directly downwind of a point source at distances specified by the user. The effect of limiting vertical dispersion by a mixing height can be included and gradual plume rise to the point of final rise is also considered. An option allows the calculation of isopleth half-widths for specific concentrations at each downwind distance.

Document citations:

Uses Briggs plume rise methods and Pasquill-Gifford Dispersion Methods as given in Workbook of Atmospheric Dispersion Estimates, EPA AP-26.

User's Guide to the Interactive Versions of Three Point Source Dispersion Programs: PTMAX, PTDIS, PTMTP, Preliminary Draft, EPA Meteorology Lab. RTP, NC 27711.

Source program available as part of UNAMAP (Version 3), PB 277 193, $420, NTIS, Springfield, VA 22161.

Assumptions:

This program determines the concentration at ground level from a single point source using a steady state Gaussian model. The computations used are similar to those shown in the Workbook of Atmospheric Dispersion Estimates. The dispersion parameter values are also those given in Figures 3-2 and 3-3 of this Workbook. The concentrations are for a single meteorological condition defined by a stability class using the numbers 1 through 6 to represent the Pasquill stability types A through F. The single wind speed used is assumed to be representative of the top of the stack, as well as through the layer that plume rise occurs. The effect of a definite limit to vertical dispersion or mixing height is included in the computations. It is assumed that complete eddy reflection occurs at this barrier. It is assumed that the given stability occurs from ground level to the mixing height. The concept of a mixing height is not employed for stabilities 5 or 6. It is assumed that there are no topographic obstructions in the vicinity of the source and that the source is in an area of either flat or gently rolling terrain. No consideration of the possibility of aerodynamic downwash is included.

Current implementation:	Minicomputer, Mainframe computer
Current hardware:	Mainframe UNIVAC 1110, VAX 11/780
Software language(s):	FORTRAN, FORTRAN IV Plus
Word size(s):	32-bit
Operating system(s):	VAS
Lines of source code:	625
Number of subroutines:	3
Input requirements:	

Can run additional meteorological data, or additonal sources and meteorology, or other distances, additional sources and meteorology in the same run. STABILITY CLASS, wind speed, mixing height and characteristics of the source.

Output format:	Ground level concentration for a set of meteorological conditions.
Source program storage:	9K core
User manual:	Yes
Systems documentation:	No
Date of latest documents:	1973
Machine interface:	Interactive, batch
Learning difficulty:	Low
Output inter. difficulty:	Low
Continued enhancement:	No
Confidentiality:	Released to the public
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	No
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant: dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No
Variable stability class:	Yes

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Model acronym:	PTMTP
Model name:	PTMTP
Sponsor:	EPA
Developer:	EPA
Contact:	D. Bruce Turner
Contact address:	US EPA Environmental Sciences Research Lab., Mail Drop 80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Availability:	See APRAC-1A
Type of model:	Air
Summary:	Estimates hourly concentrations at multiple receptors for multiple point sources.

Abstract:

Estimates for a number of arbitrarily located receptor points at or above ground level, the concentration from a number of point sources. Plume rise is determined for each source. Downwind and crosswind distances are determined for each source-receptor pair. Concentrations at a receptor from various sources are assumed additive. Hourly meteorological data are used; both hourly concentrations and averages over any averaging time from one to 24 hours can be obtained.

Document citations:

Uses Briggs plume rise methods and Pasquill-Gifford dispersion methods as given in Workbook of Atmospheric Dispersion Estimates, EPA AP-26.

Turner, D.B. and Busse, A.D., Users Guides to the Interactive Version of the Three Point Source Dispersion Programs: PTMAX, PTDIS, PTMTP, Preliminary Draft, EPA Meteorological Lab., RTP, NC 27711.

Source program available as part of UNAMAP (Version 3), PB 277 193, $420, NTIS, Springfield, VA 22161.

Assumptions:

The assumptions that are made in this model follow: Meteorological conditions are steady state for each hour and a Gaussian plume model is applicable to determine ground-level concentrations. Computations can be performed according to the Workbook of Atmospheric Dispersion Estimates. The dispersion parameter values used for the horizontal dispersion coefficient, sigma y, and the vertical dispersion coefficient, sigma z, are those given in Figures 3-2 and 3-3 of the Workbook. The sources and receptors exist in either flat or gently rolling terrain, and the stacks are tall enough to be free from building turbulence so that no aerodynamic downwash occurs. The wind speed and wind direction apply from the shortest to the tallest plume height. No wind direction shear or wind speed shear occurs. The given stability exists from ground level to well above the top of the plume.

Current implementation:	Minicomputer, mainframe computer
Current hardware:	Mainframe UNIVAC 1110, VAX 11/780

Software language(s):	FORTRAN, FORTRAN IV-Plus
Word size(s):	32-bit
Operating system(s):	VMS
Lines of source code:	661
Number of subroutines:	3

Input requirements:

Wind direction, wind speed, stability class, mixing height, and ambient air temperature for each hour, and source characteristics - emission rate, physical height, stack gas temperature, volume flow or stack gas velocity and diameter.

Output format:

Estimates output concentrations at various heights - hour by hour partial concentrations, if desired and total concentrations, plus all input information.

Source program storage:	10K core
User manual:	Yes
Systems documentation:	No
Date of latest documents:	1973
Machine interface:	Interactive, batch
Learning difficulty:	Low
Output interpretation difficulty:	Low
User support:	Yes
Continued enhancement:	No
Confidentiality:	Release to the public
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes

Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No
Variable stability class:	Yes

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Model acronym:	PTMAX
Model name:	PTMAX
Sponsor:	EPA
Developer:	EPA
Contact:	D. Bruce Turner
Contact address:	US EPA Environmental Sciences Research Lab., MD-80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Type of model:	Air
Summary:	Estimates maximum short-term concentration by stability and wind speed.

Abstract:

PTMAX produces an analysis of maximum concentration as the function of wind speed and stability. A separate analysis is made for each individual stack. Input to the program consists of ambient air temperature, and characteristics of the source, such as emission rate, physical stack height, and stack gas temperature. Either the stack gas volume flow or both the stack gas velocity and inside diameter at the top are also required. Outputs of the program consist of effective height of emission, maximum ground-level concentration, and distance of maximum concentration for each condition of stability and wind speed.

Document citations:

Workbook of Atmospheric Dispersion Estimates, EPA: AP-26 (PTMAX uses Briggs plume rise methods and Pasquill-Gifford dispersion methods described in AP-26).

Turner, D.B and Busse, A.D., User's Guide to the Interactive Versions of Three Point Source Dispersion Programs: PTMAX, PTIDS, and PTMTP, Preliminary Draft, EPA Meteorology Lab, Research Triangle Park, NC 27711, 1973.

Source program is available as part of UNAMAP (Version 3), PB 277 193, $420, NTIS, Springfield, VA 22161.

Assumptions:

The following assumptions are made: a steady state Gaussian plume model is applicable to determine ground-level concentrations. Computations can be performed according to the Workbook of Atmospheric Dispersion Estimates. The dispersion parameter values used for the horizontal dispersion coefficient, sigma y, and the vertical dispersion coefficient, sigma z, are those given in Figures 3-2 and 3-3 of the workbook. The stated wind speed occurs at the stack top for dilution of the plume and through the layer that the plume rise occurs. The state stability occurs from ground level to well above the top of the plume. If there is a limit to vertical mixing, it occurs far above the top of the plume so that it has no influence upon the maximum concentration. There are no topographic obstructions in the vicinity of the source. The source exists in either flat or gently rolling terrain.

Implementation level:	Minicomputer and mainframe computer
Current hardware:	Mainframe UNIVAC 1110, VAX 11/780

Software language(s):	FORTRAN and FORTRAN IV-Plus
Word size(s):	32-bit
Operating systems:	VMS
Lines of source code:	460
Number of subroutines:	2
Input requirements:	Ability to run additional sources in the same run. Ambient air temperature and characteristics of the source.
Output format:	Two-dimensional table giving maximum concentration, distance to maximum and height of final rise for each stability-wind speed combination.
Source program storage:	9K core
User manual:	Yes
Systems documentation:	No
Date of latest documents:	1973
Machine interface:	Interactive, batch
Learning difficulty:	Low
User support:	Yes
Continued enhancement:	No
Confidentiality:	Release to public
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No
Variable stability:	Yes

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Model acronym: PTPLU
Model name: Point Source Gaussian Plume Model
Contact: Tom Pierce
Contact address: US EPA Environmental Sciences Research Lab., MD-80, Research Triangle Park, NC 27711
Contact telephone: (919) 541-4565
Type of model: Air
Summary: Screening model for estimating maximum surface concentration from point source.

Abstract:

PTPLU is a point source dispersion Gaussian screening model for estimating maximum surface concentrations for 1-hour concentrations. PTPLU is based upon Briggs plume rise methods and Pasquill-Gifford dispersion coefficients as outlined in the Workbook of Atmospheric Dispersion Estimates. PTPLU is an adaptation and improvement of PTMAX which allows for wind profile exponents and other optional calculations such as buoyancy-induced dispersion, stack downwash and gradual plume rise.

PTPLU produces an analysis of concentration as a function of wind speed and stability class for both wind speeds constant with height and wind speeds increasing with height. Use of the extrapolated wind speeds and the options allows the model user a more accurate selection of distances to maximum concentrations.

Document citations:

The PTPLU source program is presently available on the MPTER tape from Computer Products, NTIS, PB80-163156; Springfield, VA 22161, $420.

The PTPLU program will also be available on UNAMAP (Version 4) scheduled to arrive at NTIS in December 1980. Preparation of a user's guide is underway, and the user's guide should be available by October 1981.

Validation: OAQPS has reviewed and approved.
Assumptions:

PTPLU calculates the source receptor distance to the point of maximum concentration for each wind speed and stability class. Relatively inert pollutants are modeled and emissions are assumed to be constant. The plume is spread horizontally and vertically using P-G dispersion coefficients, Briggs dispersion, stack downwash and gradual plume rise. PTPLU does not allow for any depletion of the plume by physical removal or chemical reactions. Eddy reflection with the ground is assumed. If the effective plume height is calculated to be below the mixing height in neutral and unstable conditions, then multiple reflections of the plume between the ground and the mixing height are computed. But if the effective plume height is above the mixing height in neutral and unstable conditions, then no calculations are made for ground level concentrations. Also, ground-level concentrations are no calculated if the distance to maximum concentration extends beyond 100 kilometers from the source. Cautionary messages are printed for plume heights greater than 200 meters and plume resident times greater than those expected under normal atmospheric conditions.

Current implementation:	Mainframe computer
Current hardware:	UNIVAC 1100/82, IBM 360, and CDC 6600
Software language(s):	FORTRAN - ASCII
Word size(s):	IBM 360 32-bit, CDC 6600 60-bit
Lines of source code:	957
Number of subroutines:	6
Input requirements:	

PTPLU is extremely convenient since only nominal effort is needed to supply the necessary input. Four data cards are needed for a single run; however, additional separate point sources can be analyzed by input of two data cards for every source. Information required to run PTPLU includes selection of options, anemometer height, wind profile exponents, stack parameters (emission rate, stack height, exit velocity, stack gas temperature and stack diameter), receptor height and mixing height.

Output format:

PTPLU is a screening model and its output results can be helpful in more detailed modeling. In particular, the tables of concentration and distance to maximum concentration can be examined for selection of receptor distances for use in detailed models.

Load module storage:	12K core memory on UNIVAC
Data storage:	None
Machine interface:	Batch
Learning difficulty:	Low
Output interpretation difficulty:	Low
User support:	Yes
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	No
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No

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Model acronym:	**RAM**
Model name:	Gaussian Plume Multiple Source Air Quality Algorithm
Sponsor:	USEPA Environmental Sciences Research Laboratory Office of Research and Development
Developer:	USEPA Environmental Sciences Research Laboratory Office of Research and Development
Contact:	D. Bruce Turner
Contact address:	EPA Environmental Sciences Research Lab Mail Drop 80 Research Triangle Park, NC 27711
Contact telephone:	(919)541-4564
Type of model:	Air
Summary description:	Estimates short-term dispersion using the Gaussian steady state model.

Abstract:

Gaussian Plume Multiple Source Air Quality Algorithm. This short-term Gaussian steady state algorithm estimates concentrations of stable pollutants from urban point and area sources. Hourly meteorological data are used. Hourly concentration and averages over a number of hours can be estimated. Briggs plume rise is used. Pasquill-Gifford dispersion equations with dispersion parameters thought to be valid for urban areas are used. Concentrations from area sources are determined using the Hanna's method; that is, sources directly upwind are considered representative of area source emissions affecting the receptor. Special features include determination of receptor locations downwind of significant sources and determination of locations of uniformly spaced receptors to ensure good area coverage with a minimum number of receptors.

Document citations:

Source program available as part of UNAMAP (Version 3), $420, NTIS, PB 277 193, Springfield, VA 22161

Novak, J.H., and Turner, D.B., "An Efficient Gaussian Plume Multiple Source Air Quality Algorithm." Journal of the Air Pollution Control Association, 26(6), 1976, 560-575.

Level of Validation: OAQPS has reviewed and approved this model.

Abstract:

Source-Receptor Relationship. The model assumes an arbitrary location for point sources, and the receptors may be: 1) arbitrarily located, 2) internally located near individual source maxima, or 3) on a program-generated hexagonal grid to give good coverage to a user-specified portion of the region of interest. Receptors are all assumed to be at the same height above (or at) ground, and a flat terrain is assumed.The model uses a unique stack height for each point source. The model user may specify up to three effective release heights for area sources, each assumed appropriate for a 5 m/sec wind speed. The value used for any given area source must be one of these three. A unique separation for each source-receptor pair is used.

Emission Rate: The model assumes a unique constant emission rate for each point and area source. Area source treatment encompasses: narrow plume approximation; area source used as input (not subdivided into uniform elements); arbitrary emission heights input by user; areas must be squares (side length = integer multiples of basic unit); effective emission height equals that appropriate for a 5 m/sec wind; and the area source contributions are obtained by numerical integration along upwind distance of narrow plume approximation formulas for contribution from area sources with given effective release heights.

Chemical Composition: This is treated as a single inert pollutant.

Plume Behavior: The model uses Briggs (8), (9) and (10) plume rise formulas and does not treat fumigations or downwash. If the plume height exceeds the mixing height, the ground-level concentration is assumed to be zero.

Horizontal Wind Field: The model uses user-supplied hourly wind speeds and user-supplied hourly wind directions (nearest 10 degrees, internally modified by addition of a random integer value between -4 degrees and +5 degrees). Wind speeds are corrected for release height based on power law variation, exponents from DeMarrais (6); different exponents for different stability classes are used, and the reference height is equal to 10 meters. A constant, uniform (steady state) wind is assumed within each hour.

Vertical Wind Speed: This is assumed to be equal to zero.

Horizontal Dispersion: The model uses a semiempirical /Gaussian plume, and hourly stability class is determined internally by Turner (3) procedure (six classes are used). Dispersion coefficients are from McClroy and Pooler (4) (urban) or Turner (7) (rural). No further adjustments are made for variations in surface roughness or transport time.

Vertical Dispersion: A semiempirical /Gaussian plume is used. Hourly stability class is determined internally. Dispersion coefficients are from McElroy and Pooler (4) (urban) or Turner (7) (rural). No further adjustments are made for variations in surface roughness.

Chemistry/Reaction Mechanism: The model assumes an exponential decay with a user-input half life.

Physical Removal: This is not treated.

Current implementation:	Mainframe computer, Minicomputer
Current hardware:	1)Mainframe Univax 1110 2)Vax 11/780
Software language(s):	1) FORTRAN 2) FORTRAN IV - Plus
Word size(s):	2)32 bit
Operating system(s):	2)VMS
Lines of source code:	4547
Number of subroutines:	14
Input requirements:	Meteorological data and emissions data
Input databases:	National Weather Service hourly observations - card deck 144

Output format:

Hourly and average (up to 24 hours) concentrations at each receptor; a limited individual source contribution list; cumulative frequency distribution based on 24 hour averages and up to 1 year of data at a limited number of receptors.

Source program storage:	41K core
User manual:	Yes
Systems documentation:	Yes
Date of latest version:	1978
Date of latest documents:	1978
Machine interface:	Batch
Learning difficulty:	Medium
Interpretation difficulty:	Low-medium
User support:	Yes
Continued enhancement:	Yes
Confidentiality:	Release to public.
Statutory authority:	EPA Guideline Model (1978).
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable time speed:	Yes
Variable time direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No
Exponential decay and a user-input half-life:	Yes

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Model acronym:	RCDM
Model name:	Regional Climatological Dispersion Model
Developer:	Teknekron Research, Inc.
Contact:	Carl W. Benkley
Contact address:	Teknekron Research Inc., 69 Hickory Drive, Waltham, MA 02154
Contact telephone:	(617) 890-6270
Type of model:	Air
Summary:	Steady state, regional scale, two-dimensional prediction of long-term average concentrations.

Abstract:

The Regional Dispersion Model (RCDM) is a steady state regional scale two-dimensional dispersion model for predicting long-term average (e.g., monthly or yearly) concentrations from single or multiple point and area sources at distances greater than 50 km. The model is designed for a coupled set of pollutants linked by a mechanism which is either slow and irreversible (e.g., SC_2, SO_4) or fast and reversible (e.g., NO/NO_2). The long-term average concentration is based upon a regional scale diffusivity and a resultant average wind vector field. Because it is a steady state model, RCDM enjoys a decided cost advantage over trajectory or grid models for long averaging times and large source inventories. RCDM is therefore especially useful for predicting the effects of energy growth on seasonal or average annual air quality and air quality related values such as pollutant dry and wet deposition.

RCDM computes long-term average pollutant concentrations or deposition patterns for a coupled set of pollutants, based on the analytical solution of the steady state two-dimensional advection-diffusion equation.

The model incorporates mesoscale diffusivity, resultant wind vector, wet and dry removal, and either a linear decay mechanism or an equilibrium mass coefficient. The model can handle either point or area sources, and any arbitrary rectangular coordinate system.

Document citations:

Fay, J. A. and Rosenzweig, J. T., "An Analytical Diffusion Model of Long Distance Transport of Air Pollutant", Atmospheric Environment 14, pp. 355-365, 1980.

Nieman, B.L., Mills, M.t., Hirata, A.A., and Tong, E.Y., Air Quality Meteorology in the Ohio River Basin--Baseline and Future Impacts, pp. 270, Teknektron Research, Inc., 1980.

Principal users:	Teknekron Research, Inc.
Validation:	Not reviewed by OAQPS

Assumptions:

RCDM assumes that the time averaging of pollutant parcels can be represented by horizontal diffusion in a two-dimensional steady state wind field. It also assumes that a single set of dispersion and removal parameters is appropriate for an individual source, independent of distance or travel time.

Current implementation:	Mainframe computer
Current hardware:	Mainframe IBM 360/370, 3033
Software language:	FORTRAN
Word size(s):	32-bit

Input requirements:

Inputs to the model include: job specifications, dispersion, removal parameters, resultant wind field and emissions inventory. RCDM prints all input information.

Available input database: Sulfure Regional Experiment (SURE) emissions inventory

Output format:

RCDM produces a gridded field of time-averaged concentration or deposition for each pollutant. An output tape or disk file may be created for interface with a postprocessing package which allows for graphical display of output fields.

Load module storage:	2000 words
User manual:	No
Date of latest document:	1980
Analytical Features for Model:	Air Quality
Physical loss out of element:	Yes
Variable wind speed:	Yes
Variable wind direction:	Yes
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Multielement interactive:	See 2.
Single element:	See 2.
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	Yes
Localized:	No
Time scale: Hours:	No
Time scale: Days:	Yes Monthly
Time scale: Years:	Yes Yearly
1) Linear decay mechanism or equilibrium mass coefficient:	Yes
2) Coupled set of pollutants linked by a mechanism	Yes

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Model acronym: REED
Model name: Rocket Exhaust Effluent Modeling for Tropospheric Air Quality and Environmental Assessments (NASA Rocket Exhaust Effluent Diffusion Model)
Sponsor: NASA
Developer: Many contributors, but primarily for Marshall Space Flight Center
Type of Model: Air
Summary: Affords air quality and environmental assessments for mission planning activities and for launch operations support.

Abstract:

The NASA/MSFC Multilayer Diffusion Model is designed to take the output of the exhaust cloud rise model and generate a mapping for the air quality concentration levels of the exhaust constituents. This is accomplished by using one of two techniques, the unlayered first-order technique or the layered second-order technique. The two first-order techniques are: (1) the plume technique (model 1) where cylindrical distribution is assumed and (2) the ground cloud technique (model 3) in which an ellipsoidal distribution in a homogeneous surface transport layer is assumed. The second-order techniques are: (1) the static plume technique (model 2) where it is assumed that there is a layer where no turbulent mixing occurs and (2) the distribution technique (model 4) where the surface transport layer is layered into statistically thermodynamically and kinematically homogeneous layers along with a well-distributed technique. There is a precipitation scavenging option (model 5), or Σ-option, to account for the depletion of an exhaust constituent during rain; there is a deposition option (model 6), or Δ option, to account for gravitational settling; a new option, the T-option, has been added to account for surface absorption of a constituent. These options afford the potential for studying the earth quality.

Document citations:

Stephens, J., Stewart, B. and Stewart, R.B., Rocket Exhaust Effluent Modeling Modeling for Tropospheric Air Quality and Environmental Assessments, NASA: TR-473, June 1977.

Dembauld, R.K., and Bjorklund, J.R., NASA/MSFC Multilayer Diffusion Models and Computer Programs - Version 5, NASA CR-2631, prepared for Marshall Space Flight Center by H.E. Cramer Co., December 1975.

Principal users: NASA
Validation: Medium
Assumptions:

The general differential equation for kinematic diffusion is linearized by assuming that the meteorological profile represents the homogeneous average atmospheric conditions over the layer of interest and solved by separation of variables for the spatial distribution of the concentration and dosage resulting from the launch of an aerospace vehicle.

Current implementation:	Minicomputer, mainframe computer
Current hardware:	UNIVAC 1108; plotting routines Stromberg-Carlson (SC 4020) machine
Software language(s):	FORTRAN IV
Word size(s):	36-bit
Lines of source code:	4600
Number of subroutines:	255, many are plotting routines
Input requirements:	Meteorological data from raw data and soundings are forecasted.
Output format:	Atmospheric profiles of the thermodynamic and kinematic structure, temporal history of the exhaust cloud ascent, centerline concentrations and dosages, and concentration isopleths.
Source program storage:	42700 locations of core storage on UNIVAC 1108
User manual:	Yes
Systems documentation:	Yes
Machine interface:	Interactive on mini
Continued enhancement:	Research operational status
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	Yew
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes) Continuous or nearly instantaneous sources
Linear sources:	) from rocket launch
Area sources:	)
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	Yes Multielement - noninteractive
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes Or Less (minutes)
Time scale: Days:	No
Time scale: Years:	No

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Model acronym:	REGMOD
Model name:	Regional Episodic Grid Model
Developer:	Teknekron Research, Inc.
Contact:	Michael Mills
Contact address:	Teknekron Research Inc., 69 Hickory Drive, Waltham, MA, 02154
Contact telephone:	(617) 890-6270
Type of model:	Air
Summary:	Regional scale, two-dimensional, numerical grid model for predicting short-term air quality impacts.

Abstract:

The Regional Episodic Grid Model (REGMOD) is a regional scale two-dimensional numerical grid model designed for predicting short-term air quality impacts from multiple source inventories. REGMOD computes episodic concentration and deposition behavior in a spatially and temporally varying wind field. The model is designed for a coupled set of pollutants linked by a mechanism which is either slow and irreversible (e.g., SO_2/SO_4) or fast and reversible (e.g. NO/NO_2). REGMOD is appropriate for large-scale energy growth studies. The model can be used in conjunction with subregional "trajectory" and local "straightline Gaussian" models in multiple-scale analyses.

REGMOD computes short-term average pollutant concentrations and deposition patterns for a coupled set of pollutants. The solution of the two-dimensional advection-diffusion equation is carried out in a spatially and temporarily varying wind field using a Fast Fourier Transform (FFT) technique, which is both accurate and computationally efficient. REGMOD includes first-order transformation of primary to secondary pollutants and the wet and dry removal of both species.

Document citations:

Prahm, L.P. and Christensen, O., "Long-Range Transmission of Pollutants Simulated by a Two-Dimensional Pseudospectral Dispersion Mode," Journal of Applied Meteorology, 16, pp. 898-910, 1976.

Nieman, B.L., Mills, M.T., Hirata, A.A., and Tong, E.Y., Air Quality Meteorology in the Ohio River Basin--Baseline and Future Impacts, Teknekron Research, Inc., 1980.

Principal users:

Teknekron Research, Inc. for: (1) the Ohio River Basin Energy Study (ORBES), (2) Regional Air Quality Impact Assessment of Wood Burning in TVA; (3) Air Quality Benefits of the Increased Use of Solar Power and (4) Analysis of Coal Conversion Air Quality Impacts.

Validation: OAQPS has not reviewed.

Assumptions:

REGMOD does not explicitly account for pollutant diffusion - rather, diffusion is implicitly considered by advection in a spatially and temporally varying wind field. The model assumes that the wind field is two-dimensional, and that pollutants are uniformly mixed through a constant vertical depth.

Current implementation:	Mainframe computer
Current hardware:	Mainframe IBM 360/370, 3033
Software language(s):	FORTRAN
Word size(s):	32-bit
Input requirements:	

Inputs to the model include: job specification, dispersion and removal parameters, time sequences of gridded wind fields and gridded emission inventory.

Output format:

REGMOD produces gridded sequences of concentration or deposition fields for each pollutant. An output tape or disk file may be created for interface with postprocessing packages which allow for (1) graphical display of concentration fields and (2) concentration of output fields with those of subregional or local scale models.

Load module storage:	2000 words for each time step if results saved.			
User manual:	No			
Date of latest documents:	1980			
Analytical Features for Model:	Air Quality			
Reactive pollutant:	See 1			
Nonreactive pollutant:	See 1			
Physical loss out of element:	Yes	Regional and sub-continental:	Yes	
Variable wind speeds:	Yes	Localized:	No	
Variable wind direction:	Yes	Time scale: Hours:	Yes	short-term
Variable inversion base height:	Yes	1. first order transformation of primary to secondary:	Yes	
Point sources:	Yes			
Linear sources:	No	2. A coupled set of pollutants linked by a mechanism:	Yes	
Area sources:	Yes			
Complex topography:	No			
Simple topography:	Yes			
Vertical pollutant dispersion:	No			
Crosswind pollutant dispersion:	No			
Multielement interactive:	See 2			
Single element:	See 2			
Simultaneous pollutant introductions:	Yes			

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Model acronym:	ROLLBACK
Model name:	Modified Rollback
Contact:	Warren P. Freas
Contact address:	US EPA Off. of Air Quality Planning and Standards, Monitoring and Data Analysis Div., MD-14, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-5488
Type of model:	Air
Summary:	Estimates changes in air quality due to assumed change in emissions.

Abstract:

The Modified Rollback Model is a computerized air quality simulation model that has been used for assessing the relative air quality impacts of alternative control strategies which are national in scope. Air Quality projections for carbon monoxide and nitrogen oxides are made using the Empirical Kinetic Modeling Approach (EKMA) standard isopleth diagram. Emission inventory projections are made using data on mobile and stationary source emission factors, VMT growth rates, stationary source retirement rates, growth rates and control efficiencies.

Modified Rollback can be used to estimate changes in carbon monoxide (CO) and annual average nitrogen dioxide (NO_2) levels due to assumed changes in CO and NOx emissions, respectively. Changes in ozone air quality levels are estimated, using the standard isopleth diagram of EKMA. These procedures are best used to compare the relative air quality impacts of alternative area source control strategies. The model requires county-level or larger emissions inventories, by major source category.

Document citations:

DeNevers, N. and Morris, J.R., "Rollback Modeling: Basic and Modified," Journal of the Air Pollution Control Association, Vol. 25, September 1975.

Wilson, J.H., Jr., Methodologies for Projecting the Relative Air Quality Impacts of Emission Control Strategies, presented at the 71st Annual APCA Meeting, Houston TX, June 25-29,1978.

Uses, Limitations and Technical Basis of Procedures for Qualifying Relationships Between Photochemical Oxidants and Precursors, EPA-450/2-77-021a, U.S. EPA, Research Triangle Park, N.C., November, 1977.

Principal users:

Has been used by EPA to evaluate the relative air quality impacts of revisions to the automative emission standards. Other applications include the regulatory analyses conducted in association with the review of the ambient air quality standards.

Validation: Reviewed and approved by OAQPS.

Assumptions:

The simple rollback model is based on the assumption that the air quality concentration of a pollutant at a point is equal to the background concentration of that polluant and some linear function of the total emission rate of that pollutant which influences the concentration at that point. Modified Rollback uses the deNevers-Morris equations to account for differing rates of growth/reduction in emissions from a number of source categories. The model assumes that the spatial and temporal distributions of emissions and the meteorological conditions remain constant between the base year and the projection year. However, in ozone projections, the model uses the standard EKMA isopleths described in Reference 3.

Current implementation:	Mainframe computer
Current hardware:	Mainframe IBM 360, UNIVAC 1108
Software language(s):	FORTRAN
Word size(s):	32-bit, 36-bit
Input requirements:	

For each study area, the user must furnish data on the base year air quality level, background concentration, emissions, growth and retirement rates, and control efficiencies for each major mobile and stationary source category and strategy scenario.

Availability databases:

The air quality data aretypically obtained from the Storage and Retrieval of Aerometric Data Base (SAROAD) and the emissions data from the National Emissions Data System (NEDS).

Output format:

Output reports consist of individual source area emissions inventories for the base year and each projection year/strategy combination and air quality summary reports. The air quality summary reports, grouped by strategy, display the base year air quality concentration and projection year air quality levels and expected number of violations of the National Ambient Air Quality Standards (NAAQS) for each study area.

User manual:	No
Date of latest document:	1978
Learning difficulty:	low
Analytical Features for Model:	Air Quality
Reactive pollutant:	Yes
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	No
Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No

Variable incident sunlight:	No
Point sources:	No See 1
Linear sources:	No See 1
Area Sources	No See 1
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	No
Crosswind pollutant dispersion:	No
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introduction:	No
Regionaland subcontinental:	Yes
Localized:	Yes
Time scale: Hours:	No
Time scale: Days	No
Time scale: Years:	Yes
1. Mobile and stationary emission factors:	Yes

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Model acronym:	RPM-II
Model name:	Reactive Plume Model
Sponsor:	EPA
Developer:	Systems Applications, Inc. (SAI)
Contact:	Kenneth L. Schere
Contact address:	Environmental Sciences Research Lab., MD-80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4524
Type of model:	Air
Summary:	Estimates concentrations of species within chemically reactive point source plume.

Abstract:

The Reactive Plume Model (RPM-II) is an air quality simulation model that provides a time history of pollutant concentrations within a chemically reactive point source plume. Its purpose is to estimate the concentration levels these species will attain within the plume downwind of the source by simulating in the model the physical and chemical processes responsible for the plume's evolution. These include the emissions of primary pollutants from the source, their transport and dispersion downwind, their chemical transformation into secondary products and the entrainment of background ambient air into the plume. Simulated species of particular interest would include NO, NO_2, and O_3.

Document citations:

Yocke, M.A., Stewart, D.A., Kiu, M.K. and Burton, C.S., Evaluation of RPM-II and Simple Short-Term NO_2 Model Predictions Using MISTT Data, proc. of Second Joint Conference on Applications of Air Pollution Meteorology, New Orleans, LA, March 1980.

Liu, M.K., Stewart, D.A. and Roth, P.M., An Improved Version of the Reactive Plume Model (RPM-II), paper presented at the Ninth NATO/CCMS International Technical Meeting on Air Pollution Modeling, Toronto, Canada, August 1978.

Principal users:	SAI for EPA.
Validation:	Medium, OAQPS has not reviewed.

Assumptions:

The plume is assumed to advect downwind of the source according to the specified hour averaged wind speed and direction. Fickian dispersion is assumed to govern the diffusion between adjacent cells in the model and all cells are assumed to be well mixed. The numerical solution of the set of chemical reactions is by a modified version of the GEAR routine, a predictor-corrector method for stiff systems of differential equations. It is implicitly assumed that the Carbon Bond-II mechanism is an accurate description of the chemical transformations of Nox-HC-O_3 in the real atmosphere.

The model's limitations include the requirement for valid ambient concentration estimates of reactants along the plume trajectory and the specification of valid wind speeds and dispersion rates, especially in complex terrain applications.

Current implementation:	Mainframe computer
Current hardware:	Mainframe UNIVAC 1110 or equivalent
Software language(s):	FORTRAN
Word size(s):	36-bit

Input requirements:

Inputs to the model include: wind speed and dispersion rates as functions of time and downwind distance, respectively, average initial concentrations for all species and the time-varying ambient concentrations (an option), hourly source emission rates, and the time-varying photolysis rates for the photolysis chemical reactions. The reactions comprising the chemical kinetic mechanism are also a set of inputs.

Output format:

Outputs from RPM-II include: a printout of all input data, a printout of the program control variables, a printout of plume concentrations, plume widths, plume depths, wind speed, photolysis factors at various downwind distances, and printer plots of average plume and ambient concentrations versus time. Average concentrations are printed for each species within each plume cell as well as average concentrations for the entire plume.

User manual:	In draft form from EPA		
Date of latest documents:	1980		
Analytical Features of Model:	Air Quality		
Reactive pollutant:	Yes		
Nonreactive pollutant:	No		
Physical loss out of element:	No		
Variable wind speeds:	Yes		
Variable wind directions:	Yes		
Variable reactive pollutants:	Yes		
Point sources:	Yes		
Linear sources:	No		
Area sources:	Yes on a virtual point source basis		
Complex topography:	No		
Simple topography:	Yes		
Crosswind pollutant dispersion:	Yes		
Multielement interactive:	Yes	Variable (space) dispersion rates:	Yes
Single element:	No	Variable (time) photolysis rates:	Yes
Simultaneous pollutant introduction:	No		
Regional and subcontinental:	Yes		
Localized:	Yes		
Time scale: Hours:	Yes		
Time scale: Years:	No		

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Model acronym:	SAIASP
Model name:	SAI Airshed Model
Developer:	Systems Applications, Inc. (SAI)
Contact:	Kenneth L. Schere
Contact address:	US EPA Environmental Sciences Research Lab, MD-80, Research Triangle Park, NC 27711
Type of model:	Air
Summary:	Estimates the evolution of concentrations of urban atmospheric smog-related pollutants.

Abstract:

The SAI AIRSHED Model is a grid-type photochemical air quality simulation model. Its primary purpose is to estimate the evolution of concentrations of urban atmospheric smog- related pollutants, including ozone. These concentration estimates are based on simulating the physical and chemical processes occurring in the ambient atmosphere that are responsible for ozone production. These include the emissions of organics and $NO_{(x)}$, chemical reactions of these precursors, advection and dispersion among grid cells, and transport of ozone and its precursors into the model region from upwind areas. The precursors include the order of one day. This model is quite complex and is rather input data-intensive. Nevertheless, it is useful for providing spatial and temporal resolution of ozone concentration estimates based on a detailed consideration of the underlying physical and chemical processes.

Document citations:

Ames, J. et al., "The User's Manual for the SAI-Airshed Model," EM 78-79 Environmental Protection Agency, Research Triangle Park, NC 27711, Aug 1978.

Kummler, R.H., Cho, B., Roginski, G., Swha, R., and Greenberg, A., "A Comparative Validation of RAM and Modified SAI Models for Short-Term SO_2 Concentrations in Defrost," J. Air Pollut. Control Assoc. 29(7), pp. 720-723, July 1979.

Principal users:

Has been used by EPA and some state agencies to estimate the impact of emission controls on urban ozone concentrations. The model is currently undergoing evaluation and verification as part of the EPA Regional Air Pollution Study (RAPS) model validation program.

Validation: Medium,not reviewed by OAQPS.

Assumptions:

The SAI Airshed Model uses a finite difference method to calculate the progression of pollutant concentrations through a series of time steps. The model assumes flat terrain in estimating concentrations, although the influence of the terrain on the wind field can be considered if the user is able to do so. All emissions and all concentrations are assumed uniformly mixed throughout each grid cell. It is assumed that turbulent fluxes are linearly related to the gradient in the mean concentrations so that eddy

diffusivities are used in the diffusion calculations. The principal limitations of the model are its complexity and the substantial amount of data required.

Current implementation:	Mainframe computer
Current hardware:	Mainframe UNIVAC 1110
Software language(s):	FORTRAN
Word size(s):	36-bit
Input requirements:	

The SAI Airshed Model requires various emissions, meteorological and air quality data for each grid cell in the grid system. The emissions inventory must be gridded hourly and must include NO_2, NO, and five classes of organics. The meteorological and air quality input data are interpolated from the values measured by a relatively dense monitoring network. The meteorological data include wind speed, wind direction, mixing height, atmospheric stability and photolysis rate constant. The air quality data include concentrations of NO(x), organics, and ozone at the beginning of the simulation and at the upwind boundary. If an inert pollutant is being simulated, only data for that pollutant are necessary.

The principal output of the model is a printed array of concentrations at ground level or any level aloft throughout the grid for each hour for each major pollutant. This array of concentrations is also put into disk storage in case the user wishes to develop programs to analyze the data further. In addition, the model provides the option of estimating concentrations at specific sites by interpolating among the concentrations in the surrounding grid cells.

User manual:	Yes
Systems documentation:	Draft form
Date of latest documents:	1979
Analytical Features for Model:	Air
Reactive pollutant:	Yes
Nonreactive pollutant:	Yes
Physical loss out of element:	Yes
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	Yes
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area Sources:	Yes
Complex topography:	No
Vertical pollutant dispersion:	Yes
Multielement interactive:	Yes
Single element:	Yes
Simultaneous pollutant introduction:	Yes
Regional & subcontinental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	Yes
Time scale: Years:	No
Variable space & time stability & photolysis rate:	Yes

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Model acronym:	SIGMET
Developer:	Science Applications, Inc.
Contact:	Dr. Art Boni
Contact telephone:	(714) 454-3811 ext. 2312
Availability:	Commercial or lease to govenment
Type of model:	Chemical Spills and Air
Summary:	Dense gas dispersion model based on three-dimensional conservation equations.

Abstract:

The SIGMET model developed by SAI uses finite-difference equations describing conservation of mass, momentum and energy to predict the spreading, evaporation and eventual dispersion of LNG from accidential spills. The modeling techniques are not specific to LNG vapor dispersion and could be applied to the prediction of dispersion of other gases added to the atmospheric boundary layers. The segment of atmospheric space network of points at which prediction is to be made of the time history of the local velocities, temperature and LNG vapor concentration in the evolving LNG vapor cloud.

Document citations:

England, W.G., Teuscher, L.H., and Freeman, B., Atmospheric Dispersion of Liquified Natural Gas Vapor Clouds Using SIGMET, a Three-Dimensional Time-Dependent Hydrodynamic Computer Model, Heat Transfer and Fluid Mechanics Institute, Washington State University, Pullman, Washington, June 26-28, 1978.

Havens, J.A., A Description and Assessment of the SIGMET LNG Vapor Dispersion Model, United States Coast Guard Report No. CG-M-3-79, Jan. 1979.

Havens, J.A., Predictability of LNG Vapor Dispersion from Catastrophic Spills onto Water: An Assessment, U.S. Coast Guard Report CG-M-09-77, NTIS, AD/A-040 525, April 1977.

Level of Validation: Medium-high

Assumptions:

Hydrostatic approximation, neglects molecular diffusion, viscous dissipation effects, viscous sheat stress in the x and y component of momentum. Utilizes finite-difference approximation to the mass, momentum and energy balance equations. Specified initial and boundary conditions representing an accidental release of LNG onto water.

Current implementation:	Mainframe
Current hardware:	CDC 7600, CRAY could be converted to the CDC 7600
Software language(s):	FORTRAN IV slight variations on CRAY vectorized subroutines
Word size(s):	60-bit, 64-bit
Operating system(s):	In house DEC-10 has some problems with the CRAY
Lines of source code:	2000-3000

Number of subroutines: 20
Input requirements:

Free format, and F10.0 + IS, Sigmet 1 gentle terrain 1) Met. data 2) terrain grid size, 3) type of gas, molecular weight and physical data 4) source term data

Availability input
- database: Code for simulating wind fields-nobal
Output format: Line printer concentration up to 20 flags, tabulation

Source program storage:	Depends on grid 40x10x10		
Load module storage:	1. 350K words on Cray 2. Smaller		
User manual:	Yes		
Systems documentation:	Yes		
Date of first version:	Sigmet I 1975		
Date of latest version:	1981		
Date of latest documents:	1981		
Machine interface:	Interactive or batch		
Learning difficulty:	Low-medium (two weeks)		
User support:	Yes		
Debugging maintenance:	Yes		
Continued enhancement:	Yes		
Update frequencies:	Almost continuously		
Analytical Features for Model:	Air Quality		
Reactive pollutant:	No		
Nonreactive pollutant:	Yes		
Physical loss out of element:	Yes		
Variable wind speeds:	Yes	Single element:	Yes
Variable wind direction:	Yes	Simultaneous pollutant introductions:	Yes
Variable inversion base height:	Yes	Regional and sub-continental:	Yes
Variable reactive pollutants:	No	Localized:	Yes
Variable incident sunlight:	No	Time scale: Hours:	Yes
		Time scale: Days:	Yes
Point sources:	Yes		
Linear sources:	Yes		
Area sources:	Yes		
Complex topography:	Yes		
Simple topography:	Yes		
Vertical pollutant dispersion:	Yes		
Cross-wind pollutant dispersion:	Yes		
Multielement interactive:	Yes		

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Model acronym:	SLAB
Model name:	SLAB
Sponsor:	DOE
Developer:	LLNL, L. Morris Morgan
Contact address:	David L. Morgan, L-451 Lawrence Livermore Nat. Lab, P.O. Box 808, Livermore, CA 94550
Contact telephone:	(415) 422-5104
Availability:	Public
Type of model:	Air (Chemical Spills)
Summary:	Quasi-three-dimensional model for cold or heavy gas releases using layer-averaged conservation equations.

Absract:

Quasi-three-dimensional model to predict the cloud features as a function of position and time of cold or heavy gas and other relevant quantities due to gravity flow and dispersion following a spill of liquified gas under arbitrary atmospheric conditions. The cloud features include concentration, height, width, temperature, and motion.

Document citations:

Zeman, O., The Dynamics and Modeling of Heavier-Than-Air, Cold Gas Releases, Lawrence Livermore National Laboratory Report UCRL-155224, Livermore, CA, 1980.

Ermak, D.L., Chan, S.T., Morgan, D.L. and Morris, L.K., A Comparison of Dense Gas Dispersion Model Simulations with Burro Series LNG Spill Tests Results, Lawrence Livermore National Laboratory Preprint UCRL-86713, Livermore, CA, to be published in the Journal of Hazardous Materials.

Principal users:	LLNL
Validation:	Medium

Assumptions:

Cannot handle rough terrain, assumes a simple dependence of cloud descriptors on crosswind and vertical distance; does not consider water vapor condensation, employs mixed layer concepts to derive layer-averaged conservation equations.

Current implementation:	Mainframe computer
Current hardware:	CDC 7600
Software language(s):	FORTRAN IV
Word size(s):	60 bits
Operating system:	LTSS own system
Lines of source code:	5000
Number of subroutines:	24
Input requirements:	Free formal, ASCII
Output products:	Standard ASCII products of cloud features
Source program storage:	50,500 octal words
Load module storage:	200,705 octal words
User manual:	No

Systems documentation:	Yes
Date of first version:	1980
Date of latest version:	1981
Date of latest documents:	1981
Machine interface:	Batch and interactive
Learning difficulty:	Medium
User support:	Yes, if under contract
Debugging Maintenance:	Yes, if under contract
Continued enhancement:	Yes
Update frequencies:	Once a year on model, 6 months on code
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	No
Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	No
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No

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Model acronym:	TCM2
Model name:	Texas Climatological Model Version 2
Sponsor:	Same as Above
Developer:	Texas Air Control Board
Contact:	Cyril Durrenburger; James Bryant
Contact address:	Texas Air Control Board Permits Section, 6330 Highway East, Austin, TX 78723
Contact telephone:	(512) 451-5711
Availability:	See APRAC-1A
Type of model:	Air
Summary:	Estimates long-term average concentrations of Nonreactive pollutants.

Abstract:

The Texas Climatological Model Version 2 (TCM-2) uses the steady-state Gaussian plume hypothesis, is a relatively fast FORTRAN computer program to predict ground level, long-term concentrations of atmospheric pollutants. The Briggs plume rise, the Pasquill-Gifford-Turner dispersion equations and sector averaging are used in this model. Contributions from area sources are determined by a modification of the method developed by Gifford-Hanna. An emissions inventory and a set of meteorological conditions are input to the model by the user.

Concentrations for one or two pollutants may be determined for long averaging times. Any number of area and point sources may be analyzed. Concentrations are calculated for up to 2500 locations in a user-defined rectilinear array of receptors. Up to 5 sets of meteorological conditions in the form of a meteorological joint frequency function and average ambient temperature may be input to the model. Important user options are exponential pollutant decay, use of only final plume rise, choice of urban or rural dispersion and calibration with observed concentrations. A variety of other input and output options are available to enhance the utility of the model.

Document citations:

Texas Air Control Board, User's Guide to the Texas Climatological Model, Austin, Texas, August 1980.

Principal users:	State air pollution control agencies, meteorological consultants and industry.
Validation:	OAQPS has reviewed and approved.

Assumptions:

A. The emission rate is constant for each set of meteorological conditions.
B. Wind speed - The pollutants are transported downwind at an appropriate average wind speed. Wind speed is adjusted to physical stack height.
C. Wind Shear - There is no directional wind shear in the vertical.
D. Plume Behavior - The plume is infinite with no pollutant losses due to reaction or deposition at the surface.

E. Chemistry Reaction Mechanisms - The pollutants are nonreactive gases or aerosols and remain suspended in the air following the turbulent movement of the atmosphere. There is an option to use exponential decay of pollutant concentration based upon a user-input half-life.
F. Horizontal and Vertical Dispersion - The concentration in the vertical direction is described by Gaussian distribution about the plume center line. Dispersion coefficients are from Pasquill-Gifford-Turner with no additional adjustments being made for variations in surface roughness. Horizontal dispersion is described by sector averaging instead of by a Gaussian distribution. A meteorological joint frequency function is used to describe dispersion in the horizontal.

Current implementation:	Mainframe computer
Current hardware:	(1) Mainframe Burroughs 6810/11; (2) Univac 1100
Software language(s):	FORTRAN
Lines of source code:	2004
Number of subroutines:	8
Input requirements:	Input to the TCM-2 is as follows:

1. Control parameter cards specify the input and output options, grid spacing and orientation, etc.
2. Calibration factor cards
3. Meteorological joint frequency function value cards
4. Area source inventory cards
5. Point source inventory cards
6. Monitoring data cards

Input options: (1) Point source inventory parameters may be in metric or English units. (2) Point source inventory may be read from cards or disk file. (3) Meteorological joint frequency function may be read from cards or disk file.

Output format: TCM-2 output options are:

(1) List of coordinates and concentration at each grid receptor
(2) An array map of grid coordinates and concentration
(3) A capability list identifying the highest five major concentration contributors and respective contributions
(4) A list of the point of maximum concentration for each scenario
(5) Card punch output for input to contour plotting programs

Source program storage:	41K core on Univac, 17K words storage on Burroughs
User manual:	Yes
Systems documentation:	Yes
Date of latest documents:	1980
Machine interface:	Batch
Learning difficulty:	Medium
User support:	Yes
Statutory authority:	EPA guidelines model (1978)
Analytical Features for Model:	Air Quality
Reactive pollutant:	No

Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant or pollutants:	Yes
Multielement interactive:	No See 2
Single element:	Yes See 2
Simultaneous pollutant introduction:	Yes
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	No
Time scale: Days:	Yes seasonal
Time scale: Years:	Yes annually
(1) Exponential decay by user input half-life	Yes
(2) 1 or 2 pollutants may be run-no interaction	Yes

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Model acronym:	TEM-8
Model name:	Texas Episodic Model Version 8
Sponsor:	Texas Air Control Board
Developer:	Same as above
Contact:	Keith Zimmerman, James Bryant
Contact address:	Texas Air Control Board Permits Section, 6330 Highway 290, Austin, TX 78773
Contact telephone:	(512) 451-5711
Type of model:	Air
Summary:	Short-term steady state Gaussian plume concentration estimates of nonreactive pollutants.

Abstract:

The Texas Episodic Model Version 8 (TEM-8) uses the steady state Gaussian plume hypothesis in a relatively fast FORTRAN computer program designed to predict ground-level, short-term concentrations of atmospheric pollutants. The Briggs plume rise and the Pasquill-Gifford-Turner dispersion equations are used in the model. Concentrations from area sources are determined, using the method developed by Gifford-Hanna. An emissions inventory and a set of meteorological conditions are input to the model by the user.

Concentrations for one or two pollutants may be determined for time periods from 10 minutes to 24 hours. The model, as supplied, may analyze up to 300 individual point sources and up to 50 area sources but these size limits are easily expanded. Concentrations are calculated at up to 2500 locations in a user-defined rectilinear array of receptors. An automatic grid feature in the program may be used to define a grid that encompasses the point of maximum concentration. A variety of input and output options are available to enhance the utility of the model. Up to 24 sets of meteorological conditions may be input to the model. Exponential decay of pollutant concentration may be calculated as a user option.

Document citations:

Texas Air Control Board, User's Guide to the Texas Episodic Model, Austin, Texas, October 1979.

Dames & Moore, Final Report Phase I Bay Area Sulfur Oxides Study for Bay Area Air Quality Management District, October 1979.

Principal users:	State air pollution control agencies, meteorological consultants and industry.

Assumptions:

(a) Emission Rate. The emission rate is constant. (b) Wind Speed. The pollutants are transported downwind at an appropriate average wind speed. Wind speed is adjusted to the physical stack height. (c) Wind Shear. There is no directional wind shear in the vertical. (d) Plume Behavior. The plume is infinite with no plume history. The plume is reflected at the earth's surface with no pollutant losses due to reaction or deposition at the

surface. (e) Chemistry Reaction Mechanism. The pollutants are nonreactive gases or aerosols and remain suspended in the air following the turbulent movement of the atmosphere. There is an option to use exponential decay of pollutants concentration based upon a user-input half-life. (f) Horizontal and Vertical Dispersion. Dispersion occurring in the downwind direction is negligible compared to advection. The concentrations in both the crosswind and the vertical directions are described by the Gaussian distribution about the plume centerline. Dispersion coefficients are from Pasquill Gifford-Turner with no additional adjustments being made for variations in surface roughness. Horizontal coefficients (sigma-y) are assumed to represent dispersion over a 10-minute averaging period and are increased for longer averaging times to represent the greater horizontal plume meander due to fluctuations in wind direction.

Current implementation:	Mainframe computer
Current hardware:	Mainframe Burroughs 6801/11, UNIVAC 1100
Software language(s):	FORTRAN
Word size(s):	36-bit
Lines of source code:	3778
Input requirements:	

A. Input to the TEM-8 is as follows: (1) Control parameter cards specify the input and output options grid spacing and orientation, etc. (2) Scenario parameter (meteorological conditions) cards, (3) Area source inventory cards, (4) point source inventory cards. B. Input options: (1) Point source inventory parameters may be in metric or English units, (2) Point source inventory may be read from cards or disk file.

Output format:

TEM-8 output options are: (1) list of coordinates and concentrations at each grid receptor, (2) an array map of grid coordinates and concentrations, (3) a culpability list identifying the highest five major concentrations contributors and respective contributions, (4) a list of the point of maximum concentration for each scenario, (5) card punch output for input to contour plotting programs.

Source program storage:	39K core on UNIVAC
Load module storage:	26K words disc storage on Burroughs
User manual:	Yes
Systems documentation:	Yes
Date of latest document:	1979
Machine interface:	Batch
Learning difficulty:	Medium
User support:	Yes
Statutory authority:	EPA guideline model (1978)
Analytical Features for Model:	Air Quality

Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident Sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind dispersion of pollutants:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional & Subcontinental elements:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No
Exponential decay by user input half-life:	Yes
One or two pollutants may be run - no interaction:	Yes

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Model acronym:	TRAJ (EPA's) ARL-ATAD (Standard)
Model name:	Air Resources Laboratory Atmospheric Transport and Diffusion Model
Sponsor:	DOE, Originally USAF Technical Applications Center and the Division of Biomedical and Env. Research, ERDA
Developer:	J.L. Heffter, NOAA-ARL
Contact:	Dale Coventry
Contact address:	US EPA Env. Sciences Research Lab., Monitoring & Data Analysis, Reseach Triangle Park, NC 27711
Contact telephone:	(919) 541-3668
Availability:	Public
Type of model:	Air
Summary:	Post-tacto trajectory model calculates transport, diffusion, and deposition of effluents on regional and continental scales.

Abstract:

The Air Resources Laboratories Atmospheric Transport and Dispersion Model (ATAD) is oriented toward practical application for pollution studies. ATAD calculates trajectories of 5 days duration from any number of origins, starting every 6 hours during any selected period (e.g., a day, month, or season), moving either forward or backward in time. Each trajectory is calculated using transport winds averaged in a vertical layer. Dispersion calculations are made for the forward trajectories. Standard model output includes tables of transport layer depth, maximum vertical wind shear in the transport layer, and trajectory positions. Optional output includes trajectory plots and maps of time-averaged surface air concentrations and deposition amounts.

Document citations:

Jerome L. Hefter, NOAA Technical Memorandum, ERL ARL-81 ARL-ATAD, 1980.

Hefter, J.L., Taylor, A.D., and Ferber, G.J., A Regional-Continental Scale Transport, Diffusion and Deposition Model, NOAA Tech. Memo. ERL ARL-50, June 1975.

Principal users:	ARL, BNL
Validation:	Medium-high, OAQPS has not reviewed.

Assumptions:

The model moves the trajectory with the average value of the winds in the layer selected, either surface or aloft. Concentration and deposition puffs are transported along the trajectory paths. The model should not be used at short distances from the sources.

Current implementation:	Mainframe computer
Current hardware:	Mainframe UNIVAC 1110, IBM 360/95
Software language(s):	FORTRAN, FORTRAN H extended plus
Word size(s):	36-bit, 32-bit

Input requirements:

Trajectory end point, starting data, number of days, direction in time, transport layer, map boundaries, met data provided by NCC sorted by time and stored on magnetic tape.

Input databases: NAMER-WINDTEMP data tapes #9753 available from NCC, NOAA

Output format:

Consists of latitudes and longitudes of trajectory positions at 6-hour intervals printed in tabular form. Additional output options include plots of observed vertical temperature and wind profiles, tables of model-calculated transport layer depths and plots of the trajectories on a lat-long grid. Concentration and deposition calculations are output on a similar lat-long grid.

Load module storage:	UNIVAC 34K, IBM 24K core storage, magnetic tape storage one reel
User manual:	Yes
Systems documentation:	Yes
Date of first version:	1975
Date of latest version:	1980
Date of latest documents:	1980
Machine interface:	(1) batch, (2) batch, interface, (3) interactive
Learning difficulty:	Medium
Output interpretation difficulty:	Low-medium
User support:	Yes
Continued enhancement:	Yes
Analytical Features for Model	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	Yes
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	Yes
Localized:	No
Time scale: Hours:	Yes
Time scale: Days:	Yes
Time scale: Years:	Yes
Variable transport layer:	Yes

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Model acronym:	**Turner's Workbook**
Model name:	Workbook of Atmospheric Dispersion Estimates
Sponsor:	EPA, Office of Air Programs
Developer:	D. Bruce Turner
Contact address:	Office of Technical Information and Publications Office of Air Programs, EPA, Research Triangle Park, NC 27711
Availability:	Public
Type of model:	Air
Summary:	Methods to estimate atmospheric concentrations of contaminants from various types of sources.

Abstract:

This workbook presents methods of practical application of the binormal continuous plume dispersion model to estimate concentrations of air pollutants. Estimates of dispersion are those of Pasquill as restated by Gifford. Emphasis is on the estimation of concentrations from continuous sources for sampling intervals,inversion breakup fumigation concentrations, and concentrations from area, line, and multiple sources. Twenty-six example problems and their solutions are given. Some graphical aids to computation are included.

Document citations:

Turner, D.B., Workbook of Atmospheric Dispersion Estimates, Office of Air Programs Publication No. AP-26, U.S. Environmental Protection Agency, Research Triangle Park, NC, 1970.

Principal users:	Widespread use
Validation:	Medium

Assumptions:

Continuous emission from the source of emission times equal to or greater than travel times to the downwind position under consideration, so that diffusion in the direction of transport may be neglected.

The material diffused is a stable gas or aerosol (less than 20 microns diameter) which remains suspended in the air over long periods of time.

The equation of continuity is fulfilled; i.e., none of the material emitted is removed from the plume as it moves downwind and there is complete reflection at the ground.

The mean wind direction specifies the x-axis, and a mean wind speed representative of the diffusing layer is chosen.

Except where specifically mentioned, the plume constituents are distributed normally in both the crosswind and vertical directions.

The time periods are about 10 minutes.

Current implementation:	Handbook
User manual:	Yes
Latest documentation:	1970
Learning difficulty:	Medium
Analytical Features for Model	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	Yes
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement, interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	No
Long time periods such as seasonal or annual are discussed.	Yes

(50)

Model acronym:	VALLEY
Model name:	Gaussian Plume Dispersion Algorithm
Sponsor:	US EPA, Office of Air and Waste Management, Office of Air Quality Planning and Standards
Developer:	Same as above
Contact:	D. Bruce Turner
Contact address:	EPA Environmental Sciences Research Lab., MD-80, Research Triangle Park, NC 27711
Contact telephone:	(919) 541-4564
Type of model:	Air
Summary:	Estimates upper limits of 24-hour average pollutant concentrates due to isolated sources in rural complex terrain.

Abstract:

This algorithm is a steady state, univariate Gaussian plume dispersion algorithm designed for estimating either 24-hour or annual concentrations resulting from emissions from up to 50 (total) point and area sources. Calculations of ground-level pollutant concentrations are made for each frequency designed in an array defined by six stabilities, 16 wind directions, and six wind speeds for 112 program-designed receptor sites on a radial grid of variable scale. Empirical dispersion coefficients are used and include adjustments for plume rise and limited mixing. Plume height is adjusted according to terrain elevations and stability classes.

Document citations:

Burt, E., Valley Model User's Guide, EPA-450/2-77-018.

Source program available as part of UNAMAP (Version 3), PB 277-193, $420, NTIS, Springfield, VA 22161.

Assumptions:

Source-Receptor Relationship. Each point source is assigned an arbitrary location. Each area source is given an arbitrary location and size. The model provides 112 receptors on a radial grid for 16 directions; relative radial distances are internally fixed and the overall scale may be modified by the user. The location of the grid center is defined by the user. A unique release height for each point and area source is given by VALLEY. Receptors are at ground level, and ground-level elevations above mean sea level are defined by the user. The total number of sources for the model is less than or equal to 50.

Emission Rate. A single rate is utilized by each point and area source. Each source is treated by an effective point source approximation, and no temporal variation is allowed.

Chemical composition: This is not applicable to VALLEY.

Plume Behavior: The model uses Briggs (1971, 1972) plume rise formula for both point and area sources. Alternatively, a single constant plume rise value may be input for any or all sources. VALLEY does not treat fumigation or downwash.

Current implementation:	Mainframe computer, minicomputer
Current hardware:	Mainframe UNIVAC 1110, VAX 11/780
Software language(s):	FORTRAN V, FORTRAN IV Plus
Word size(s):	32-bit
Operating system(s):	VMS
Lines of source code:	1000
Number of subroutines:	2
Input requirements:	

Point and area residual discharges and stack parameters; meteorological data; ambient air concentration measurements.

Input databases:	STAR data from NCC
Output format:	

Long-term arithmetic means and a source contribution list for each receptor (long term mode); second highest 24-hour concentration and a source contribution list for each receptor (short-term mode).

Source program:	14K core		
User manual:	Yes		
System documentation:	Yes		
Date of latest version:	1979		
Date of latest documents:	1979		
Machine interface:	Batch		
Learning difficulty:	Medium-high		
User support:	Yes		
Confidentiality:	Release unlimited		
Statutory authority:	EPA guideline model (1978)		
Analytical Features for Model:	Air Quality		
Nonreactive pollutant:	Yes		
Physical loss out of element:	No	Time scale 24 hours or annual	Yes
Variable wind speeds:	Yes	Crosswind pollutant dispersion:	Yes
Variable wind direction:	Yes	Multielement interactive:	No
Variable inversion base height:	Yes	Single element:	Yes
Variable reactive pollutants:	No	Simultaneous pollutant introductions:	Yes
Variable incident sunlight:	No	Regional and sub-continental:	No
Point sources:	Yes	Localized:	Yes
Linear sources:	--		
Area sources:	Yes		
Complex topography:	Yes		
Simple topography:	Yes		
Vertical pollutant dispersion:	Yes		

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SECTION II
MULTIMEDIA MODELS
(Air, Water and Land)

1. ALWAS
2. EICS
3. ENPART
4. NEELY METHOD
5. NLEV 3
6. UTM

(1)

Model acronym:	**ALWAS**
Model name:	Air, Land, Water Analysis System
Sponsor:	EPA, Athens, GA, Environmental Research Lab
Developer:	Arthur D. Little, Inc.
Contact:	Kenneth F. Hedden, Project Leader
Contact address:	Technology Development & Applications Branch Athens Environmental Research laboratory Athens, GA 30605
Contact telephone:	(404) 546-3476
Availability:	Public
Type of model:	Multimedia, (Air, Water and Land)

Abstract:

ALWAS can simulate the effects on surface water quality of multimedia toxicant releases to the environment. It is most suitable for persistent organic chemicals which tend to adsorb to particulate matter, but ALWAS or various combinations of its submodels, may also provide valuable multimedia information for metals and more soluble organics, given care in its application.

Document citation:

Tucker, William A., Eschenroeder, Alan Q, and Magil, Gary G. Air, Land, Water Analysis System (ALWAS): A Multimedia Model for Asessing the Effects of Airborne Toxic Substances on Surface Water Quality, (First Draft Report), Arthur D. Little, Campbridge, MA 02140.

Principal users:	EPA
Validations:	Low (not verified for any field situation)
Current Implementation:	Minicomputer, Mainframe Computer
Current hardware:	IBM 370, PDP 11/70
Software language(s):	FORTRAN
Word size(s):	IBM 32-bit, PDP 11/70 16 bit

Input requirements:

Meteorological land configuration, chemical (much is formatted and namelisted).

Input databases:

Meteorological Data - National Climatic Center SAROAD and NEDS.

Output format:	Tabular
User manual:	Yes
Systems documentation:	No

Machine Interface:	Both Interactive and Batch
Learning difficulty:	Medium
User support:	No
Debugging maintenance:	No
Analytical Feature of Model:	Water Quality
Toxic substance:	No
Water temperature:	Yes
DO level:	Yes
Benthal oxygen:	No
Cloforms:	No
Chlorophyll-A:	No
Radioactive constituents:	No
Salinity:	No
Conservative Minerals:	Yes
Time dependent input:	Yes
Changes in channel flow:	Yes
Aeration:	Yes
Respiration:	No
Photosynthesis:	No
Waste Treatment Plant input:	No
Evaporation and precipitation effects:	Yes
Time-variant polluant:	Yes
Point source:	Yes
Nonpoint source:	Yes
Steady state:	Yes
Unsteady state:	Yes
Stream and river:	Yes
Reservoir and lake:	Yes
Estuarine:	Yes
Ocean inlet:	No
Dam computation:	No
Mixing zone:	No

Analytical Features for Model:	Air Quality
Reactive polllutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	Yes
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No

Analytical Feature of Model:	Surface Water Hydrology
Small watershed areas:	Yes
Rural land areas:	Yes
Urban land areas:	Yes
Entire Hydrographs:	Yes
Flood routing:	No
Snowmelt considerations:	Yes
Continuous simulation of a storm event:	Yes
Continuous simulation in real time:	Yes
Sedimentation and scour:	Yes
Water flow from a simulation:	No
Automatic time interval Generation:	No

Regional & subcontinental:	No
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	No
Time scale: Years:	Yes

(2)

Model acronym:	EICS
Model name:	Interactive Environmental Impact Computer System
Sponsor:	Directorate of Military Programs, Office of the Chief Engineers (OCE)
Developer:	U.S. Army Construction Engineering Research Lab., (CERL), Environmental Division (EN)
Contact:	Dr. Harold Balbach; Dr. Edward Novak
Contact address:	U.S. Army, Construction Engineering Research Lab., P.O. Box 4005, Champagne, IL 61820
Contact telephone:	(217) 352-6511
Availability:	Public
Type of model:	Multimedia (Air, Water and Land)

Abstract:

EICS is one of three major subsystems of the Environmental Technical Information System (ETIS), a computerized system which provides information useful in preparing environmental impact assessments and statements (EIAs/EISs). EICS enables a user to determine how an Army action may affect various aspects of the environment.

Document citations:

Baran, R., and Webster, R.D., Interactive Environmental Impact Computer System (EICS) User Manual, Technical Report N-80, U.S. Army Corps of Engineers, Construction Engineering Res. Lab.(CERL), September 1979.

Novak, E.W. and Riggins, R.E., Computer-Aided Environmental Impact Analysis for Mission Change, Operations and Maintenance, and Training -- User Manual, Technical Report E-85/ADA022698,CERL, February 1976.

The Economic Impact Forecast System -- Description and User's Instructions. DA PAM 200-2,Department of the Army, December 1976.

Thomas, S.E., Mitchell, R.A., Riggins, R.E., Fittipaldi, J.J., and Novak, E.W., Computer-Aided Environmental Impact Analysis for Industrial, Procurement and Research, Development, Test and Evaluation Activities -- User Manual, Technical Report N-43/ADA056997, CERL, May 1978.

Urban, L.V., Balbach, H.E., Jain, R.K., Novak, E.W., and Riggins, R.E., Computer-Aided Environmental Impact Analysis for Construction Activities -- User Manual, Technical Report E-50/ADA008988 CERL, March 1975.

Van Weringh, J., Patzer, J., Welsh, R., and Webster, R., Computer-Aided Environmental Legislative Data System (CELDS) User Manual, Technical Report N-56/ADA061126,CERL, September 1978.

Webster, R.R., Mitchell, R.A., Welsh, R.L., Shannon, E., and Anderson, M.L., The Economic Impact Forecast System-Description and User Instruction, Technical Report N-2/ADA027139,CERL, June 1976.

Webster, R.D., Welsh, R.L., and Jain, R.K., Development of the Environmental Technical Information System, Interim Report E-52-ADA009668, CERL, April 1975.

Attribute Description Package, Technical Report E-86/ADA024303 U.S. Army Construction Engineering Research Laboratory (CERL), March 1976.

Council on Environmental Quality, "Preparation of Environmental Impact Statements: Guidelines," Federal Register, Vol. 38, No. 147, Part II, pp. 20550-20562, August 1, 1973.

Environmental Protection and Enhancement, AR 200-1 Department of the Army, 7 December 1973.

Handbook for Environmental Impact Analysis, DA PAM 200-1, Department of the Army, April 1975.

National Environmental Policy Act of 1969, 83 Stat. 852, 42 USC 4321, et seq. January 1970.

NEPA, "Implementation of Procedural Provisions: Final Regulations," Federal Register, Vol. 43, November 29, 1978.

Principal users:	U.S. Army
Current implementation:	Minicomputer
Current hardware:	VAX 11/780
Word size(s):	32-bit
Operating system:	UNIX
Available databases:	Available with the system
Output format:	Matrix format
User manual:	Yes
Systems documentation:	Yes
Date of latest documents:	1979
Machine interface:	Interactive
Learning difficulty:	Low
Output interpretation difficulty:	Low
User support:	Yes
Debugging maintenance:	Yes
Continued enhancement:	Yes
Confidentiality:	Unclassified
Statutory authority:	Used in meeting requirements of the National Environmental Policy Act (NEPA)
Geographical area:	General
Analytical Features for Model:	Noise

Aircraft noise:	No	Loudness level:	No
Highway noise:	No	Plotted contours as output:	No
Construction noise:	No	Forest facility noise simulation:	No
Urban noise:	No	Dispersion in flight path:	No
Aircraft types:	No	Atmospheric variation	No
Transport fighters:	No	Point:	No
Propeller-driven:	No	Area:	No
Specific aircraft:	No	National exposure:	No
Aircraft descriptors:			
Detailed performance:	No		
Variation in power:	No		

Analytical Features for Model:	Surface Water Hydrology
Small watershed areas:	No
Large watershed areas:	No
Rural land areas:	No
Urban land areas:	No
Entire hydrographs:	No
Snowmelt considerations:	No
Continuous simulation of a storm event:	No
Continuous simulation in real time:	No
Sedimentation and scour:	No
Water flow from a simulation:	No
Infiltration rates:	No

Analytical Features for Model:	Water Quality
Oxygen:	No
Water temperature:	No
DO level:	No
Benthal oxygen:	No
Phosphorous:	No
Coliforms:	No
Chlorophyll-A:	No
Radio activity:	No
Salinity:	No
Conservative Minerals:	No
Time dependent input:	No
Changes in channel flow:	No
Aeration:	No
Respiration:	No
Photosynthesis:	No
Waste treatment plant input:	No
Evaporation and precipitation effects:	No
Time-variant pollution:	No
Point source:	No
Nonpoint source:	No
Steady state:	No
Unsteady state:	No
Stream and river:	No
Reservoir and lake:	No
Estuarine:	No
Ocean inlet:	No
Dam computation:	No
Mixing Zones:	No

Analytical Features for Model:	Chemical Spills Groundwater
Analyze land spills:	No
Analyze water spills:	No
Analyze flammable material spills:	No
Analyze oil spills:	No
Analyze toxic chemical spills:	No
Exact solution:	No
Finite element solution:	No
Steady state:	No
Nonsteady state:	No
One aquifer:	No
Leakage between aquifers:	No
Stream aquifer interaction:	No
Saturated element:	No
Unsaturated element:	No
Differentials across element:	No
Variable flow rates across boundary:	No

Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	No
Physical loss out of element:	No
Variable wind speeds:	No
Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	No
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	No
Vertical pollutant dispersion:	No
Crosswind pollutant: dispersion:	No
Multielement interactive:	No
Single element:	No
Simultaneous pollutant introductions:	No

Regional and sub-continental:		No
Localized:		No
Time scale:	Hours:	No
Time scale:	Days:	No
Time scale:	Years:	No

(3)

Model acronym:	ENPART
Model name:	Environmental Partitioning Model
Sponsor:	EPA
Developer:	EPA, Office of Toxic Substances, Exposure Evaluation Division
Contact:	Willam Wood
Contact address:	Environmental Protection Agency, Office of Toxic Substances, Exposure Evaluation Division 401 M Street, SW, DC 20460
Contact telephone:	(202) 426-0724
Availability:	Public
Type of model:	Multimedia (Air, Water and Land)

Abstract:

This generalized partitioning model integrates information about a chemical's production, use and disposal with laboratory data describing its physiochemical properties in order to provide insight into the dominant processes responsible for that substance's transport and degradation in the environment. It is intended to be used in early stages of chemical risk assessments to identify environmental media through which exposure may occur and to provide a guide for further assessment by indicating the media with the highest exposure potential. The methodology explicitly treats transfer between and transformation within environmental media and ranks media as to their exposure potential, and transformation processes as to the relative importance in controlling the level of exposure. The analysis can also be applied in the design of a cost-effective testing approach to yield data on interrelated transport and transformation processes which when considered together, present a clear picture of a substance's environmental fate.

Document citations:

Mackay, D., "Finding Fugacity Feasible," Env. Sci. and Tech., 13, 1238, 1979.

Reid, R.C., Prausnitz, J.M., and Sherwood, J.K., The Properties of Gases and Liquids, 3rd ed. McGraw-Hill, NY, 1977.

Chiou, C.T., et al, "Partition Coefficient and Bioaccumulation of Selected Organic Chemicals," Env. Sci. and Tech., 11, 5, 1977.

Karikhoff, S.W., et al, "Sorption of Hydropholic Pollutants on Natural Sediments," J. Envir. Qual., 7, 246-252, 1978.

Kenaga, E.E., Goring, C.A.I., Relationship Between Water Solubility Soil-Sorption, Octanol-Water Partitioning and Concentrations of Chemical in Biota. Dow Chemical Co. USA, Midland, MI 48640, March 1979.

Pilotte, James, Preliminary Draft of ENPART Documentation, General Software Corporation, Landover, MD, June 1981.

Validation: Medium

Assumptions:

The approach used in the equilibrium partitioning analysis assumes that each media compartment is homogeneously well mixed and that all compartments are in equilibrium. The dynamic partitioning portion of the model assumes that intercompartmental transfer is at steady state with transformation processes such as photolysis, hydrolysis, oxidation and biodegradation. The concentration ratios are determined using fugacity constants describing tendencies to transfer between compartments which are valid for use at low environmental concentrations.

Current implementation:	Handbook, Programmable calculator, Minicomputer, Mainframe computer
Current hardware:	Version 1 - VAX 11/780; Version 2 - TI59; Version 3 - IBM 370/160
Software languages:	FORTRAN IV for all versions except TI59
Word size(s):	32 bit (Version 1, Version 3)
Operating system(s):	Version 1: VMS; Version 3 OS/VS
Lines of source code:	5500
Number of subroutines:	35
Input requirements:	Numeric and character (unformatted)
Input databases:	None
Output format:	Tables and printer plots
Source program storage:	182K
Load module storage:	97K
User manual:	Yes
Systems documentation:	Yes, draft form
Date of first version:	1979
Date of latest version:	1981
Date of latest document:	1981
Machine interface:	Interactive and batch
Learning difficulty:	Low
Interpretation difficulty:	Low
User support:	No
Continued enhancement:	No
Confidentiality:	None
Statutory authority:	None
Geographic area:	Not applicable
Update frequencies:	Not applicable
Analytical Features for Model:	Surface Water Hydrology
Small watershed areas:	No
Large watershed areas:	No
Rural land areas:	No
Urban land areas:	No
Entire hydrographs:	No
Snowmelt considerations:	No
Continuous simulation of a storm event:	No
Continuous simulation in real time:	No
Sedimentation and scour:	No

Water flow from a simulation:	No
Infiltration rates:	No
Soil to air to water transport:	No
Steady state surface soil partitioning:	No
Analytical Features for Model	Water Quality
Oxygen:	No
Water temperature:	No
DO level:	No
Benthal oxygen:	No
Phosphorous:	No
Coliforms:	No
Chlorophyll-A:	No
Radio activity:	No
Salinity:	No
Conservative Minerals:	No
Time dependent input:	No
Changes in channel flow:	No
Aeration:	No
Respiration:	No
Photosynthesis:	No
Waste treatment plant input:	No
Evaporation and precipitation effects:	No
Time-variant pollution:	No
Point Source:	No
Nonpoint Source:	No
Steady state:	No
Unsteady state:	No
Stream and river:	No
Reservoir and lake:	No
Estuarine:	No
Ocean inlet:	No
Dam computation:	No
Mixing zones:	No
Steady state Waste Partitioning:	No
Analytical Features for Model:	Chemical Spills & Groundwater
Analyze land spills:	No
Analyze water spills:	No
Analyze flammable material spills:	No
Analyze oil spills:	No
Analyze toxic chemical spills:	No

Exact solution:	No
Finite element solution:	No
Steady state:	No
Nonsteady state:	No
One aquifer:	No
Leakage between aquifers:	No
Stream aquifer interaction:	No
Saturated element:	No
Unsaturated element:	No
Differentials across element:	No
Variable flow rates across boundary:	No
Analytical Features for Model:	Air quality
Reactive pollutant:	No
Nonreactive pollutant:	No
Physical loss out of element:	Yes
Variable wind speeds:	No
Variable wind direction:	No
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	No
Linear sources:	No
Area sources:	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	No
Multi-element interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	No
Time scale: Hours:	Yes
Time scale: Days:	Yes
Time scale: Years:	Yes
Steady state air partitioning:	Yes

(4)

Model name:	Neely Method - Partitioning Model
Sponsor:	EPA, Office of Water Reg. and Standards
Developer:	W. Brock Neely
Contact:	Same as above
Contact address:	Dow Chemical, Midland, MI
Type of model:	Multimedia (Air, Water and Land)

Abstract:

Neely's partitioning model is a screeing model which may be used to predict environmental partitioning and the importance of certain degradation and transport pathways for organic chemicals. The model is based on data from a model ecosystem. It may play a role in environmental fate assessment, in the initial steps of risk assessments for new and existing chemicals, and in the planning of laboratory and field tests for such chemicals.

Document citations:

Lymann, W.J., Prediction of Chemical Partitioning in the Environment: An Assessment of Two Screening Models, EPA report WH-533, Office of Water Regulations and Standards, 1981.

Neely, W.B., An Integrated Approach to Assessing the Potential Impact of Organic Chemicals in the Environment, preprint of paper presented at the workshop on Philosophy and Implementation of Hazard Assessment Procedures for Chemical Substances in the Aquatic Environment, Waterville Valley, NH, August 1978.

Neely, W.B., A Method for Selecting the Most Appropriate Environmental Experiments That Need to be Performed on a New Chemical, in Preprints of Papers presented at the 176th National Meeting, Miami Beach, Florida, American Chemical Society, Division of Environmental Chemistry, Vol. 18, No. 2, pp.336-337, September 10-15, 1978.

Neely, W.B, and Blau, G.E., "The Use of Laboratory Data to Predict the Distribution of Chlorpyrifos in a Fish Pond," Pesticides in the Aquatic Environment, Plenum Publishing Co., New York, 1977.

Neely, W.B., "A Preliminary Assessment of the Environmental Exposure to be Expected from the Addition of a Chemical to a Simulated Aquatic Ecosystem," Int. J. Environ. Sci., 1978.

Assumptions:

Model is based on laboratory data from a model environment. Ten chemicals were studied which exhibited a wide range of solubilities and vapor pressures. From thosedata four regression equations were derived which can be used to predict partitioning and fish clearance rates for other chemicals. Predicitons are intended for screening purposes and are not expected to provide defusible quantitative estimates of chemical partitioning.

Current implementation:	Programmable calculator
Current hardware:	Hand calculator
Input requirements:	Minimal
Output format:	Predictions of the percent of the chemical in the air, water, and soil compartments.
User manual:	Yes

Analytical Features for Model:	Surface Water Hydrology
Small watershed areas:	No
Large watershed areas:	No
Rural land areas:	No
Urban land areas:	No
Entire hydrographs:	No
Snowmelt considerations:	No
Continuous simulation of a storm event:	No
Continuous simulation in real time:	No
Sedimentation and scour:	No
Water flow from a simulation:	No
Infiltration rates:	No
Partitioning to soil:	Yes
Analytical Features for Model:	
Analyze land spills:	Yes
Analyze water spills:	Yes
Analyze flammable material spills:	Yes
Analyze oil spills:	Yes
Analyze toxic chemical spills:	Yes
Exact solution:	Yes
Finite element solution:	Yes
Steady state:	Yes
Nonsteady state:	Yes
One aquifer:	Yes
Leakage between aquifers:	Yes
Stream aquifer interaction:	Yes
Saturated element:	Yes
Unsaturated element:	Yes
Differentials across element:	Yes
Variable flow rates across boundary:	Yes
Analytical Features for Model:	Water Quality
Oxygen:	Yes
Water temperature:	Yes
DO level:	Yes
Benthal oxygen:	Yes
Phosphorous:	Yes
Coliforms:	Yes
Chlorophyll-A:	Yes
Radio activity:	Yes
Salinity:	Yes
Conservative minerals:	Yes
Time-dependent input:	Yes

Changes in channel flow:	Yes
Aeration:	Yes
Respiration:	Yes
Photosynthesis:	Yes
Waste treatment plant input:	Yes
Evaporation and precipitation effects:	Yes
Time-variant pollution:	Yes
Point source:	Yes
Nonpoint source:	Yes
Steady state:	Yes
Unsteady state:	Yes
Stream and river:	Yes
Reservoir and lake:	Yes
Estuarine:	Yes
Ocean inlet:	Yes
Dam computation:	Yes
Mixing zones:	Yes
Partitioning to water:	Yes
Analytical Features for model:	Air quality
Reactive pollutant:	Yes
Nonreactive pollutant:	Yes
Physical loss out of element:	Yes
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutants:	Yes
Variable incident sunlight:	Yes
Point sources:	Yes
Linear sources:	Yes
Area sources:	Yes
Complex topography:	Yes
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Multielement interactive:	Yes
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and subcontinental:	Yes
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	Yes
Time scale: Years:	Yes
Partitioning to air:	Yes

(5)

Model acronym:	**NLEV3**
Model name:	New Level 3
Sponsor:	EPA, Office of Water Regulations and Standards
Developer:	Arthur D. Little
Contact:	EPA: Michael Slimak
Contact address:	USEPA, Office of Water Regulation and Standards Monitoring and Data Support Division, DC, 20460
Availability:	Public
Type of model:	Multimedia (Air, Water and Land)

Abstract:

The NLEV3 program carries out the calculation for the Mackay level II and III models. (The focus is on the Level III model; the Level II output is provided for comparison.) The program is written in PL/I language and is designed to interface with remote (interactive) terminals with a 132 character line width. A terminal capable of providing printed outputs is necessary because of the volume of tabular output. A CRT-type terminal will suffice for trial runs -- where the outputs can be quickly reviewed - or for cases where only selected numbers need to be extracted from the outputs. The NLEV3 program is available at the EPA's National Computer Center (NCC) in Research Triangle Park, NC, Directions for accessing these computer facilities and the NLEV3 program are given in Section III.

The program asks the user, in an interactive manner, for the necessary inputs for each run. Only one chemical and one set of conditions can be selected/ specified in a given run. The program is easily rerun for investigations of different chemicals or conditions. In spite of the interactive nature of the program (for inputs) it will generally not be possible (or prudent) for the program to be run correctly, or meaningfully, until the user has: (1) spent some time to become familiar with the model and the NLEV3 program and (2) has prepared, in advance, the data required by the model. The required data include physiochemical properties, degradation rate constants, intercompartmental transfer rate coefficients and advection flows; all must be in the correct units for NLEV3.

Mackay's fugacity-based model is a screening model which may be used to predict environmental partitioning, and the importance of certain degradation and transport pathways, for organic chemicals. The model provides different levels of sophistication for a variety of situations. It may play a role in environmental fate assessments, in the initial steps of risk assessments for new and existing chemicals, and in the planning of laboratory and field tests for such chemicals.

Document citations:

Lyman, W.J., Prediction of Chemical Partitioning in the Environment: An Assessment of Two Screening Models, EPA report WH-553, Office of Water Regulations and Standards, 1981.

Mackay, D.,"Finding Fugacity Feasible," Environ. Sci. Technology, 13, 1218-23, 1979.

Principal users:	EPA
Validation:	Medium
Current implementation:	Mainframe computer
Current hardware:	IBM 370

Software language(s):	PL/I
Word size(s):	32 bit
Lines of source code:	593
Input requirements:	Minimal chemical physical properties
Input databases:	Model defaults for environment
Output format:	Predictions of the percent of the chemical in the air, water, and soil compartments; printed tables
Systems documentation:	Yes
User manual:	Yes
Date of first version:	1981
Date of latest version:	1981
Date of latest document:	1981
Machine interface:	Interactive
Learning difficulty:	Low
Output interpretation difficulty:	Low
User support:	No
Debugging maintenance:	No
Continued enhancement:	No
Confidentiality:	None
Geographic area:	General
Analytical Features for Model:	Surface Water Hydrology
Small watershed areas:	No
Large watershed areas:	No
Rural land areas:	No
Urban land areas:	No
Entire hydrographs:	No
Snowmelt considerations:	No
Continuous simulation of a storm event:	No
Continuous simulation in real time:	No
Sedimentation and scour:	No
Water flow from a simulation:	No
Infiltration rates:	No
Calculates partitioning to soil:	Yes
Analytical Features for Model:	Water Quality
Oxygen:	No
Water temperature:	Yes
DO level:	Yes
Benthal oxygen:	Yes
Phosphorous:	Yes
Coliforms:	Yes
Chlorophyll-A:	Yes
Radio activity:	Yes
Salinity:	Yes
Conservative minerals:	Yes
Time-dependent input:	Yes
Changes in channel flow:	Yes

Aeration:	Yes
Respiration:	Yes
Photosynthesis:	Yes
Waste treatment plant	Yes
input:	Yes
Evaporation and pre-	Yes
cipitation effects:	
Time-variant pollution:	Yes
Point source:	Yes
Nonpoint source:	Yes
Steady state:	No
Unsteady state:	Yes
Stream and river:	Yes
Reservoir and lake:	Yes
Estuarine:	Yes
Ocean inlet:	Yes
Dam computation:	Yes
Mixing zones:	Yes
Calculates Partitioning	Yes
to water:	
Analytical Features for	
Model:	Chemical Spills and Groundwater
Analyze land spills:	Yes
Analyze water spills:	Yes
Analyze flammable	Yes
material spills:	
Analyze oil spills:	Yes
Analyze toxic chemical	Yes
spills:	
Exact solution:	Yes
Finite element solution:	Yes
Steady state:	Yes
Nonsteady state:	Yes
One aquifer:	Yes
Leakage between aquifers:	Yes
Stream aquifer interaction:	Yes
Saturated element:	Yes
Unsaturated element:	Yes
Differentials across	Yes
element:	
Variable flow rates across	Yes
boundary:	
Analytical Features for	
Model:	Air Quality
Reactive pollutant:	Yes
Nonreactive pollutant:	Yes
Physical loss out of	Yes
element:	
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base	Yes
height:	
Variable reactive	Yes
pollutants:	

Variable incident sunlight:	Yes
Point sources:	Yes
Linear sources:	Yes
Area sources:	Yes
Complex topography:	Yes
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Multielement interactive:	Yes
Single element:	Yes
Simultaneous pollutant introductions:	Yes
Regional and sub-continental:	Yes
Localized:	Yes
Time scale: Hours:	Yes
Time scale: Days:	Yes
Time scale: Years:	Yes
Calculates partitioning to air:	Yes

(6)

Model acronym:	**UTM**
Model name:	Unified Transport Model
Sponsor:	EPA
Developer:	Oak Ridge National Lab
Contact:	Joan Leffler
Contact address:	TS-798 EPA, Office of Toxic Substances Evaluation Div. 401 M Street, SW Washington, DC 20460
Contact telephone:	(202) 755-8060
Availability:	Public
Type of model:	Multimedia (Air, Water and Land)

Abstract:

The Unified Transport Model is a multimedia model which simulates the movement of a chemical through an inland watershed. The model calculates the concentration of organic and inorganic chemicals in air, water, soil, sediment and biota. The UTM consists of the Atmospheric Transport Model (ATM) the Wisconsin Hydrologic Transport Model (WHTM) the Terrestrial Ecosystem Hydrology Model (TEHM) and a suite of associated submodels. The model was originally developed by Oak Ridge National Laboratory to simulate trace element transport through a forested ecosystem. The model was modified by Oak Ridge in 1980 for the Environmental Protection Agency to incorporate the transport and transformation processes associated with organic chemicals.

The model is applicable to small watersheds consisting of up to three land segments and seven reaches. The concentration of the chemical in air is determined on a monthly basis. Movement of the chemical through the terrestrial and aquatic environment is simulated at 15-minute intervals. The average monthly and annual concentrations can be calculated with an accuracy of better than an order of magnitude. The hydrologic submodel requires calibration.

Document citation:

Clukowski, W.M., and Patterson, M.R., A Comprehensive Atmospheric Transport and Diffusion Model, Oak Ridge National Laboratory Report ORNL/NSF/EATC-17, 1976.

Patterson, M.R. et al., A User's Manual for the Fortran IV Version of the Wisconsin Hydrologic Transport Model, Oak Ridge National Laboratory Report PRNL/NSF/EATC-7, 1974.

Huff, D.D., et al., TEHM: A Terrestrial Ecosystem Hydrology Model, Oak Ridge National Laboratory Report ORNL/NSF/EATC-27, 1977.

Principal users: Oak Ridge National Laboratory, EPA

Validations:

Validated under the Ecology and Analysis of trace contaminants project at ORNL. Medium applied to movement of heavy metals through a forested watershed. OAQPS has not reviewed.

Assumptions:

The chemical (organic or inorganic) is assumed to be released from point, line or area sources into air, deposited onto land and subsequently transported to ground water and surface water. The ATM consists of a steady state Gaussian algorithm. The terrestrial model is a simulation model. The ecological submodels are mechanistic in character.

Current implementation:	Minicomputer, Mainframe Computer
Current hardware:	Mainframe, IBM 370 (Version 1)
	Minicomputer VAX 11/780 (Version 2)
Software language(s):	FORTRAN IV extended (All versions)
Word size(s):	Version 1 & 2, 32 bit
Operating system(s):	Version 1 - OS/MVS, Version 2 - VMS
Lines of source code:	1100
Number of subroutines:	158

Input requirements:

The input data includes monthly wind roses, hourly precipitation, solar radiation, daily maximum and minimum temperatures, soil characteristics, topographic information, surface water characteristics, sediment characteristics, and the physiochemical properties and transformation rates associated with the chemical.

Input databases:

Nonspecific data must be compiled from various sources.

Output format:

The output consists of plots and tables summarizing the average monthly and annual chemical concentrations in eight wind sectors, in saturated and unsaturated soil layers, in runoff, out of each reach, and in the stems, leaves, roots and fruits of vegetation.

Output complexity:	High
Source program storage:	540K
Load module storage:	300K

Data storage:

Minimum 100K maximum is function of study (number of years etc.)

User manual:	Yes
Systems documentation:	Yes
Date of first version:	1976
Date of latest version:	1981
Date of latest documents:	1981
Machine interface:	Batch, for all versions
Learning difficulty:	High
User support:	No
Debugging maintenance:	No
Continued enhancement:	Yes
Geographic area:	Nonspecific
Analytical Feature of Model:	Air quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	Yes
Variable wind speed:	Yes
Variable wind direction:	Yes
Variable inversion base height:	Yes
Variable reactive pollutant:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	Yes
Area sources:	Yes
Compex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional & subcontinental:	No
Localized:	Yes
Time scale: Hours:	No
Time scale: Days:	Yes, Monthly, Seasonal
Time scale: Years:	Yes, Annual
Analytical Feature of Model:	Surface Water Hydrology
User supplied half-life:	Yes
Large watershed areas:	Yes
Rural land areas:	Yes
Flood routing:	No
Continuous simulation in real time:	Yes
Sedimentation and scour:	Yes
Infiltration rates:	Yes
Analytical Feature of Model:	Water Quality
DO Level:	No
Bethal oxygen:	No
Coliforms:	No
Salinity:	No
Conservative Minerals:	Yes
Time dependent imput:	Yes
Aeration:	No
Respiration:	No
Photosynthesis:	No
Waste treatment plant input:	No
Evaporation and precipitation effects:	Yes
Time-variant pollution:	Yes
Point source:	No
Nonpoint source:	Yes
Unsteady state:	Yes
Stream and river:	Yes
Reservoir and lake:	No
Estuarine:	No
Ocean inlet:	No
Dam computation:	No
Mixing zones:	NO

SECTION III
GEOLOGY AND SOIL MODELS

1. CSOIL
2. EARTH
3. SANGRE
4. SLOP2
5. SLOP3
6. Slope Stability Analysis 2
7. Slope Stability Analysis 3

(1)

Model acronym:	**CSOIL**
Model name:	Soil Test Borings
Model number:	CEPA No. 04.07.001
Developer:	Stanley Sapieka
Contact:	Society for Computer Applications in Engineering Planning and Architecture (CEPA)
Contact address:	358 Hungerford Drive Rockville, MD 20850
Contact telephone:	(301) 762-6070
Type of model:	Geology and soils

Abstract:

The program computes: (1) the percentages of various sizes of aggregates retained on the series of sieves subjected to dry and wet mechanical analysis, (2) textural classification (based on Triangular Classification Chart by U.S. Bureau of Soils and Chemistry), (3) moisture content, (4) unconfined compressive strength.

Current implementation:	Minicomputer
Feasible implementation:	Mainframe computer
Current hardware:	IBM 1130
Software language(s):	FORTRAN
Word size(s):	16 bit
Operating system(s):	Monitor Version 2.11

Input requirements:

Field boring log, sieve analysis of course aggregate, washed sieve analysis of material passing No. 10 sieve, hydrometer tests, moisture content tests, unconfined compressive strength tests.

Output format:

A. Detailed report: 1) Edited field log, 2) Textural classification of each sample, 3) Moisture Content, 4) Unconfined Compressive Strength,
B. Summary Report: 1) edited field log, 2) summary of textural classification, moisture content and unconfined compressive strength.

User manual:	No
Systems documentation:	No
Date of first version:	1974
Date of latest version:	1974
Estuarine:	No
Ocean inlet:	No
Dam computation:	No
Mixing zones:	No

(2)

Model acronym:	EARTH
Model name:	Earth
Model number:	DEC SRC No. 12.09
Contact:	Software Referral Catalog Manager
Contact address:	Engineering Systems Group MR1-1/M42 Digital Equipment Corporation 200 Forest Street Marlboro, MA 01752
Availability:	Public
Type of Model:	Geology and Soils

Abstract:

EARTH is a small but powerful FORTRAN program for either road or general earthwork computations. It is small enough to run on most minicomputers and powerful enough to solve even the largest of earthwork problems. EARTH uses convenient and easy to learn commands so that no prior knowledge of programming is necessary.

EARTH has a comprehensive list of commands to enable the user to compute cut and fill volumes, adjusted excess or deficit of EARTH and the mass-haul. MOVE allows the user to shift any cross-section horizontally or vertically or to add a super-elevation to it while BALANCE requires EARTH to balance the cut and fill over the job by raising or lowering the finished profiles as necessary.

EARTH also does an extensive amount of data checking which can prevent costly errors in the computations.

Current implementation:	Minicomputer
Feasible implementation:	Mainframe computer
Current hardware:	PDP-11, DEC 10/20, VAX
Software language(s):	FORTRAN
Operating system(s):	(1) RT-11, RSX-11M, RSX-11D, RSTS/E, IAS (2) TOPS-10/20 (3) VMS

(3)

Model acronym:	**SANGRE**
Model name:	Nonlinear Thermal Creep of Geological Structure
Sponsor:	Los Alamos Scientific Laboratory (LASL)
Developer:	Los Alamos Scientific Laboratory (LASL)
Contact:	Charles A. Anderson
Contact address:	Los Alamos Scientific Laboratory Group Q-13, MS-576 P. O. Box 1663 Los Alamos, NM 87545
Contact telephone:	(505) 667-5150 FTS 843-5150
Type of model:	Geology and Soils

Abstract:

SANGRE is a finite element code for predicting stresses and thermal and mass transport for geological regions undergoing long-term deformations.

Document citations:	Documentation in preparation
Principal users:	LASL
Current implementation:	Mainframe computer
Current hardware:	CDC 7600
Software language(s):	FORTRAN
Word size(s):	60 bits
Operating system(s):	CROS and LTSS
User manual:	No
Systems documentation:	No, in preparation

(4)

Model acronym:	SLOP2
Model name:	Slope Stability Analysis by Bishop's Method (circular slip)
Model number:	CEPA No. 04.01.006
Developer:	Dr. M.E. Szendrei
Contact:	Society for Computer Applications in Engineering Planning and Architecture (CEPA)
Contact address:	358 Hungerford Drive Rockville, MD 20850
Contact telephone:	(301) 762-6070
Type of model:	Geology and soils

Abstract:

Program SLOP2 computes the factor of safety for a multilayered slope, using Bishop's method of slices for circular slip. External loads may be superimposed on the slope. Effects of pore pressure are taken into account.

Assumptions:

Limitations: 10 different soil layers, 10 external loads.

Current implementations:	Minicomputer
Feasible implementation:	Mainframe computer
Current hardware:	GA 18/30
Software language(s):	FORTRAN
Operating system(s):	TSO, DMS
Lines of source code:	330
Input requirements:	Computer card input
Source program storage:	32k
User manual:	Yes
Systems documentation:	No
Dates of first version:	1976
Date of latest version:	1980
Date of latest documents:	1980

(5)

Model acronym:	SLOP3
Model name:	Slope Stability Analysis by Morgenstern's Method (General Slip)
Model number:	CEPA No. 04.01.005
Developer:	Dr. M.E. Szendrei
Contact:	Society for Computer Applications in Engineering Planning and Architecture (CEPA)
Contact address:	358 Hungerford Drive Rockville, MD 20850
Contact telephone:	(301) 762-6070
Type of model:	Geology and soil

Abstract:

Program SLOP3 computes the factor of safety for a multilayered slope, using Morgenstern's method of slices for general slip. Values for the factor of safety are determined by attempting seven different interslice force functions, and the validity of each result is checked by the line-of-thrust condition, as suggested by Morgenstern. Effects of pore pressure are taken into account either by assigning a pore pressure coefficient to each layer or by defining piezometric line.

Assumptions:

Limitations: 10 different soil layers, 19 straight segments defining the failure surface.

Current implementation:	Minicomputer
Feasible implementation:	Mainframe computer
Current hardware:	GA 18/30
Software language(s):	FORTRAN
Operating system(s):	TSO, DMS
Lines of source code:	500
Input requirements:	Computer cards
Source program storage:	32k
User manual:	Yes
Systems Documentation:	No
User manual:	Yes
Systems documentation:	No
Date of first version:	1976
Date of latest version:	1980

(6)

Model name:	**Slope Stability Analysis** 2
Model number:	CEPA No. 04, 01.002
Sponsor:	Society for Computer Application in Engineering Planning and Architecture (CEPA)
Contact:	CEPA
Contact address:	358 Hungerford Drive Rockville, MD 20850
Contact telephone:	(301) 762-6070
Type of model:	Geology and Soils

Abstract:

The program computes the safety factor against sliding on a given circular failure arc within a zoned earth embankment or natural slope. The soil zones may be of any shape. No provision is made for handling seepage forces, but the effect of a static water table within the embankment can be taken into account.

Current implementation:	Mainframe computer
Feasible implementation:	Minicomputer
Current hardware:	IBM 1130
Software language(s):	FORTRAN
Word size(s):	16 bits
Lines of source code:	200

Input requirements:

Cross-section geometry in Cartesian coordinates; angle of internal friction, unit cohesion, unit weight of each zone on cards; coordinates of failure circle and radius from console keyboard.

Output format:

Factor of safety for each arc, option to print driving and resisting forces for each soil zone.

Source program storage:	8k
Data storage requirement:	8k
User manual:	Yes
Systems documentation:	No
Date of latest version:	1972
Date of latest documents:	1972

(7)

Model name:	**Slope Stability Analysis 3**
Model number:	CEPA No. 04.01.003
Sponsor:	Society for Computer Applications in Engineering Planning and Architecture (CEPA)
Contact address:	358 Hungerford Drive Rockville, MD 20850
Contact telephone:	(301) 762-6070
Type of model:	Geology and Soils

Abstract:

The program computes the safety factor against sliding on a given circular failure arc within a zoned earth embankment or natural slope. The soil zones may be of any shape. No provision is made for handling seepage forces, but the effect of a static water table within the embankment can be taken into account.

Current implementation:	Minicomputer
Feasible implementation:	Mainframe computer
Current hardware:	DEC PDP 11/40
Software language(s):	FORTRAN
Word size(s):	16 bit
Operating system(s):	RT-11, RSX-11M, RSX-11D, IAS
Lines of source code:	200

Input requirements:

Cross-section geometry in Cartesian coordinates; angle of internal friction, unit cohesion, unit weight of each zone on cards; coordinates of failure circle, and radius from console keyboard.

Output format:

Factor of safety for each arc, option to print driving and resisting forces for each soil zone.

User manual:	Yes
Systems documentation:	No
Date of latest version:	1980
Date of latest documents:	1980

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SECTION IV
ECOLOGY MODELS

1. Lake Michigan Eutrophication
2. MS CLEANER
3. SSEG
4. Vegetation Communities on a Gradient

(1)

Model name:	**Lake Michigan Eutrophication Model**
Sponsor:	EPA
Developer:	J.P. Connolly
Contact:	Dr. John P. Connolly
Contact address:	Manhattan College Bronx, NY 10471
Contact telephone:	(212)920-0100
Availability:	WASP is a general water quality model.
Type of model:	Ecological Systems

Assumptions:

The model assumes that phytoplankton biomass may be represented by chlorophyll and that growth is controlled by the external concentrations of ammonia and nitrite-nitrate nitrogen, available phosphorus and available silica. Nutrient limitation is represented by a Michaelis expression with multiple limitation being the product of single nutrient limitation.

Current implementation:	Mainframe computer
Current hardware:	Mainframe CDC 6600
Software language(s):	FORTRAN
Word size(s):	Disc storage 150K (estimate)

Input requirements:

The anticipated input requirements include: segment volumes and depths flow and dispersion between segments, water temperature, solar radiation, photoperiod, loadings of all nutrients, settling velocities of phytoplankton and particulate nutrients, phytoplankton growth rate, temperature dependence and saturating light intensity, half saturation constants for phosphorus, nitrogen and silica limitation, carbon-to-chlorophyll ratio, phosphorus-to-chlorophyll ratio, silica-to-chlorophyll ratio, phytoplankton endogenous respiration rate and temperature dependence, zooplankton filtering rate, respiration rate and assimilation efficiency.

Output format:

The model will produce values for all variables in all segments at user specified time intervals. It will also produce pen plots of selected variables and associated data.

User manual:	Yes
Learning difficulty:	High
Geographic areas:	Lake Michigan
Analytical Features for Model:	Water quality, feature toxics nitrogen
Oxygen:	No
Water temperature:	Yes
DO level:	No

Benthal oxygen:	No
Phosphorous:	Yes
Coliforms:	No
Chlorophyll-A	Yes
Radioactivity:	No
Salinity:	No
Conservative minerals:	Yes
Time-dependent input:	Yes
Changes in channel flow:	No
Aeration:	No
Respiration:	No
Photosynthesis:	No
Waste treatment plant input:	Yes
Evaporation and precipitation effects:	No
Time-variant pollution:	Yes
Point source:	Yes
Nonpoint source:	Yes
Steady state:	Yes
Unsteady state:	Yes
Stream and river:	No
Reservoir and lake:	Yes
Estuarine:	No
Ocean inlet:	No
Dam computation:	No
Mixing zones:	No

(2)

Model acronym:	MS CLEANER
Model name:	MS CLEANER
Model number:	EPA No. M6404000118
Sponsor:	EPA
Developer:	Rensselaer Polytechnic Institute Troy, New York 12181
Contact:	Richard A. Park, Director
Contact address:	Center for Ecological Modeling, Rensselaer Polytechnic Institute, Troy, NY 12181
Contact telephone:	518-270-6494
Availability:	Public
Type of Model:	Ecological Systems
Summary:	An aquatic ecosystem model in which 50 state variables can be represented.

Abstract:

The aquatic ecosystem model MS CLEANER has had a long history of development involving numerous individuals from different disciplines. As a result, 50 different state variables can be represented (up to 40 simultaneously) and a high level of biologic realism has been achieved by giving careful attention to process-level constructs. As many as 10 different ecosystem segments can be simulated simultaneously, with dynamic linkages such as circulation and fish migration specified by the user. The model has a set of simple commands and a machine-independent namelist editor for efficient usage.

The model is programmed so as to facilitate perturbation and sensitivity analysis. Calibration and verification has utilized data from diversed lakes and reservoirs. Agreement with observed data has been good.

Document citation:

Bloomfield, J.A., et al., Aquatic Modeling in the Eastern Deciduous Forest Bione, U.S. International Biological Program, in E.J. Middlebrooks, D.H. Falkenborg and T.E. State University, Logan, Utah, pp. 138-158, 1973.

Clesceri, L.S., Park, R.A., and Bloomfield, J.A., "General Model of Microbial Growth and Decomposition in Aquatic Ecosystems," Applied and Environmental Microbiology, 33 (5), pp.1047-1958, 1977.

DeCapraris, P., et al, Ecosystem Model MS CLEANER, paper published in the Proceedings of the International Conference on Cybernetics and Society, pp. 87-89, 1977.

Desormeau, C.J., Mathematical Modeling of Phytoplankton Kinetics with Applications of Two Alpine Lakes, Master's Thesis, unpublished.

Groden, T.W., Modeling Temperature and Light Adaptation of Phytoplankton, Master's Thesis, Center for Ecological Modeling, Rensselaer Polytechnic Institute, 1977.

Park, R.A., Scavia, D., and Clescer, N.L., "CLEANER, the Lake George Model," Ecological Modeling in a Management Context, Russell, C.S., ed., Resources for the Future, Inc., Washington, D.C., pp. 49-81, 1975.

Park, R.A., et al., A Generalized Model for Simulating Lake Ecosystems Simulation, pp. 35-50, August 1974.

Park, R.A., Groden, T.W., and Desormeau, C.J., "Modifications to the Model CLEANER Requiring Further Research," Perspective of Aquatic Ecosystem Modeling, Scavia, D. and Robertson, A., eds., Ann Arbor Science Publishers, in press.

Park, R.A., "Predicting the Impact of Man on Lake Ecosystems," (abstract), Human Effects on Life in Fresh Water, Biro, P., ed., Hungarian Academy of Sciences, Tihany, 1977.

Park, R.A., Theoretical Implications of Models of Aquatic Systems, paper presented at AAAS, Biological Sciences Meeting, New York City, 1975.

Scavia, D. and Park, R.A., Documentation of Selected Constructs and Parameter Values in the Aquatic Model Cleaner, Ecological Modeling, 2 (1), pp. 33-58, 1976.

Straskraba, M., "Development of an Analytical Phytoplankton Model with Parameters Empirically Related to Dominant Controlling Variables, Umwelt-biophysik, Glaser, R., Unger, K., and Kock, M., eds., Akademic Verlag, Berlin, GDR, pp. 33-65, 1976.

Principal users:	Universities, consulting firms, federal agencies.
Validation:	Medium-high
Current implementation:	Mainframe computer
Feasible implementation:	Minicomputer
Current hardware:	Virtually machine-independent
Software language(s):	FORTRAN IV
User manual:	Yes
Machine interface:	Interactive
Learning difficulty:	High, parameters are not easy to choose.

(3)

Model acronym:	SSEG
Model name:	Spatially Segmented Phytoplankton Model
Model number:	EPA No. M64070000105
Sponsor:	EPA
Developer:	EPA-Victor J. Bierman
Contact:	Victor J. Bierman
Contact address:	EPA Office of Research & Development Environmental Reseach Lab-Duluth 9311 Groh Road Grosse Isle, MI 48138
Contact telephone:	(218) 226-7811
Type of model:	Surface Water Quality, Ecological Systems

Summary:

A phytoplankton-ecological model with 28 state variables in each segment.

Abstract:

The model describes phytoplankton growth, a function of system hydrology, phosphorus, nitrogen, silicon, light and temperature. Phytoplankton biomass is partitioned into five functional groups: diatoms, greens, non-N_2 fixing blue-greens, N_2-fixing blue-greens and "others." An internal nutrient pool kinetics mechanism is included to describe phytoplankton nutrient uptake and growth. Zooplankton are included and are partitioned into two functional groups: herbivorous and carnivorous. Compartments are included for total concentrations of phosphorus, nitrogen, and silicon in the sediments. Sediment water interactions for these nutrients are described using a wind-driven resuspension mechanism. The model is spatially segmented in the horizontal.

The model includes 28 state variables for each spatial segment. Up to five horizontal spatial segments can be included. The model is not segmented in the vertical. Values for advective flows and dispersions, nutrient loads, light, temperature and boundary conditions must be specified externally. The model is typically run for a 1-year simulation, although both larger and shorter simulations can be conducted. Results of a T-test analysis between model output and field data for Saginaw Bay, Lake Huron, indicated that the model described the field data to an accuracy of approximately 85 percent.

Document citations:

There does not exist a User's Manual at this time. The development and calibration of a single segment version of the model, including all equations and coefficients appear in:

Bierman, V.J., Jr. et al., The Development and Calibration of a Spatially Simplified Multi-Class, Phytoplankton Model for Saginaw Bay, Lake Huron, US EPA Ecological Research Series, 1980.

Results of phosphorus load reduction simulations with the spatially segmented version appear in:

Bierman, V.J., Jr. and Dolan, D.M., Responses of Saginaw Bay, Lake Huron, to Reductions in Phosphorus Loadings from the Saginaw River, Reports prepared for the International Joint Commission, 1980.

Principal users: EPA
Validation: Medium to high

Assumptions:

The model is based on the principle of mass balance for each of the 28 constituents in each segment. The model is coded in FORTRAN and consists of a series of ordinary, nonlinear, simultaneous differential equations. An Adams-Moulton predictor-corrector technique is used to solve the equations numerically. Typical time steps used are 30 minutes for the nutrient equations and 3 hours for the phytoplankton equations.

Current implementation: Mainframe computer
Current hardware: UNIVAC 1110, PDP 11/45
Software language(s): FORTRAN
Word size(s): Disc Storage 64K words
Operating system(s): Magnetic tape storage optimal

Input requirements:

To run the model, values for advective flows and dispersions, nutrient loads, light, temperature, and boundary conditions must be specified as input. To calibrate the model, segment averages of individual sampling station concentrations are needed for each state variable for the time period of interest.

Output format:

The model can produce line printer output consisting of all values for state variables and values for individual component terms in each differential equation. This can be done at daily or 5-day intervals. The model also can produce a summary data file on a disk which contains values for all state variables at 5-day intervals. This file can be used off-line to produce graphical output. A graphics program is available with the model for producing overlay plots of model output and field data.

User manual: No

(4)

Model name:	VEGETATION COMMUNITIES ALONG GRADIENT
Model number:	ORNL No. 587
Contact:	Charles R. LaFrance
Contact address:	Argonne National Laboratory Environmental Impact Studies Division 9700 S. Cass Avenue Argonne, IL 60439
Contact telephone:	FTS 972-3184
Type of model:	Ecological Systems

Summary:

Generate artificial communities composed of a finite number of discrete individuals.

Abstract:

With a minimum of input parameters (the list of required parameters varies with the version used), the model generates artificial communities composed of a finite number of discrete individuals. The underlying probability-generating functions are species-specific normal distributions describing the x-axis locations of the individuals. Statistical summaries of the parametric distributions of individuals by species are calculated. Optional features include a map showing locations of individuals, automatic sampling and analysis. Several versions exist, with varying user control of parameters and options.

Document citations:

LaFrance, C.R., "Sampling and Ordination Characteristics of Computer-Simulated Individualistic Communities," Ecology, v. 53, no. 3, pp. 387-397.

LaFrance, C.R., Computer Simulated Vegetation, proceedings of the First Indiana Univ. Computer Network Conference on Computer Related Curriculum Materials, Indiana Univ. SE, New Albany, IN, pp. 23-26, 1974.

Principal users:	University of Notre Dame
Current implementation:	Mainframe computer
Current hardware:	Univac 1107, IBM 1130
Software language(s):	FORTRAN
Word Size(s):	32 K core-Univac 1107, 32K core-IBM 1130
User manual:	No
Systems documentation:	No
Machine interface:	Univac 1107-7 track tape drive, Calcomp 563 plotter

Principal users:	U.S. Army
Current implementation:	Minicomputer
Current hardware:	VAX 11/780
Software language(s):	C
Word size(s):	32 bits
Operating system(s):	UNIX
Input databases:	Available with model-environmental legislation, both federal and state.
Output format:	Output of search requests
Output complexity:	Low
User manual:	Yes
Date of first version:	1975
Date of latest version:	1978
Date of latest documents:	1978
Machine interface:	Interactive
Learning difficulty:	Low
User support:	Yes
Debugging maintenance:	Yes
Continued enhancement:	Yes
Confidentiality:	Unclassified
Statutory authority:	Used in meeting requirements of National Environmental Policy Act (NEPA)
Geographic areas:	U.S., Germany

SECTION V
GENERAL SOCIOECONOMIC MODELS

1. CELDS
2. ELS
3. PTM

(1)

Model acronym: **CELDS**
Model name: Computer-Aided Environmental Legislative Data System
Sponsor: Directorate of Military Construction
Office of the Chief Engineers (OCE)

Developer:

James A. Gast, University of Illinois, Library Research Center of the University of Illinois; Environmental Division (EN) of the Army Construction Engineering Research Lab (CERL).

Contact address: U.S. Army
Construction Engineering Research Lab
P. O. Box 4005
Champaign, IL 61820

Availability: Public
Type of Model: Socioeconomic General (Data System)

Abstract:

CELDS is one of three major subsystems of the Environmental Technical Information System (ETIS), a computerized system which provides information useful in preparing environmental impact assessments and statements (EIAs/EISs). CELDS, a collection of current Federal and state environmental laws, regulations, and standards, has been developed for use by nonlawyers. Abstracts of the legislation are written in a straightforward narrative style with all legal jargon and excessive verbiage removed. These abstracts are not intended to replace the original documents or resolve complex legal problems; their sole aim is to provide quick access to current controls on activities that may influence the environment and to supply informative data for environmental impact analysis and environmental quality management. Legislation from all states and the Federal Government is presently included in the system, and work is continuing to incorporate laws of the Federal Republic of Germany. CELDS is continuously updated, and direct correspondence with the administering agencies is maintained to insure the currentness and completeness of the abstracted environmental legislation.

Document citations:

Weringler, J. van, et al., Computer-Aided Environmental Legislative Data System (CELDS) User Manual, U.S. Army Corps of Engineers Construction Engineering Research Lab (CERL), Technical Report N-56, Sept 1978.

Webster, R.D., Welsh, R.L., and Jain, R.K., Development of the Environmental Technical Information System, Interim Report E-52/ADA 009668 Construction Engineering Research Laboratory (CERL), March 1975.

(2)

Model acronym:	EIFS
Model name:	Economic Impact Forecast System, Version 2.0
Sponsor:	Directorate of Military Programs, Office of the Chief of Engineers (OCE)
Developer:	U.S. Army Construction Engineering Research Laboratory (CERL)
Contact address:	U.S. Army Construction Engineering Research Laboratory P.O. Box 4005 Champaign, IL 61820
Type of model:	Socioeconomics General

Abstract:

EIFS is one of three major subsystems of the Environmental Technical Information Systems (ETIS), a computerized system which provides information useful in preparing environmental impact assessments and statements (EIAs/EISs). EIFS provides information useful to estimating the socioeconomic impacts caused by new military projects and activities.

Document citations:

Hamilton, J.W. and Webster, R.D., Economic Impact Forecast System, Version 2.0: User's Manual, U.S. Army Corps of Engineers, Construction Engineering Research Lab (CERL), Technical Report N-69, July 1979.

Webster, R.D., et al., Development of the Economic Impact Forecast System (EIFS) - The Multiplier Aspects, Technical Report N-35/ADA057936, U.S. Army Construction Engineering Research Laboratory (CERL), November 1977.

Webster, R.D., et al., Development of the Environmental Technical Information System, Interim Report #-52/ADA009668 (CERL), April 1975.

Webster, R., et al., The Economic Impact Forecast System: Description and User Instruction, Technical Report 2/ADA027139, CERL, June 1976.

Webster, R., et al., The Rational Threshold Value (RTV) Technique for the Evaluation of Regional Economic Impacts, Special Report N-49/ADA055561 (CERL), May 1978.

Webster, R.D., and Moy, A.B., Tract Level Socioeconomic Data System for Solid Waste Management at Army Installations, Interim Report N-45/ADA054935 (CERL), May 1978.

Principal users:	U.S. Army
Current implementation:	Minicomputer
Feasible implementation:	Mainframe
Current hardware:	VAX 11/780
Software language(s):	C
Word size(s):	32 bit
Operating system(s):	Unix

Input databases:

With the system: Census of Population, Census of Housing, Census of Manufacturers, Bureau of Economic Analysis, County Business Patterns.

Output complexity:	Low
User manual:	Yes
Date of latest version:	1979
Date of latest documents:	1979
Machine interface:	Interactive
Learning difficulty:	Low
User support:	Yes
Debugging maintenance:	Yes
Continued enhancement:	Yes
Confidentiality:	Unclassified
Statutory authority:	Used in meeting requirements of the National Environmental Policy Act (NEPA)

(3)

Model acronym: PTM
Model name: Steel Industry Model
Sponsor: EPA
Developer: Temple, Barker, and Sloan
Contact: Robert Greene
Contact address: EPA - OPM - Office of Planning and Evaluation
PM - 220
401 M Street, SW
Washington, DC 20460
Contact telephone: (202)287-0713
Availability: Public
Type of model:

Abstract:

PTM was developed by Temple, Barker and Sloane (TBS) for the purpose of systematically analyzing the effects on the steel industry resulting from environmental regulations, input price changes or from other cost variations. The model partially relies on a modeling effort previously done by Arthur D. Little in Cambridge, Massachusetts. PTM contains three modular components: production, pollution control and finance. The two later components depend upon the production and capacity data from the production component in order to execute. Exogenous variable values for simulation were obtained through Chase Econometrics.

PTM has the capability of performing many different sensitivity analysis by altering data inputs such as the rate of return on equity, degree of cost pass through, cost of captial, etc. In addition, effects on energy usage, employment and the balance of trade stemming from environmental regulations can be estimated. Cost impacts of the Clean Air Act and other air pollution regulations can be calculated, utilizing different engineering cost estimates. The resulting revenue requirements and price effects are also computed by model.

Document Citations:

Temple, Barker, and Sloane (TBS), Analysis of Economic Effects of Environmental Regulation on the Integrated Iron and Steel Industry", Volume 1 and 2, Wellesley Hills, MA.

Principal Users: EPA

Assumptions:

In establishing a baseline forecast for the steel industry TBS has assumed that domestic steel shipments will rebound from 1975 recession levels. This adjustment is assumed to be completed by 1977 and, thereafter, steel shipments are assumed to follow the long run trend to 1983. The baseline forecast for steel shipments by 1980 is 120 million tons. The other baseline indicators needed to simulate the baseline forecast are capital expenditures, external financing needs, operations and maintenance expenses, revenue requirements and the average price of steel per ton. TBS has calculated the following numbers for the baseline forecast.

	Short Run 1975-1977	Long Run 1975-1983
Capital Expenditures	$ 8.7	$ 27.5
External Financing Needs	3.8	13.0
O & M Expenses	78.2	272.9
Revenue Requirements	96.1	338.6
Average Price (in 1975 dollars per ton)	345.26	365.21

The theoretical assumptions used in constructing PTM were not available as of this writing.

Current implementation: Mainframe computer
Feasible implementation: Minicomputer
Current hardware: IBM 370/158; UNIVAC 1110
Software language(s): FORTRAN V

Input requirements:

PTM requires many cost inputs. These consist of production costs and pollution control costs. Under these two headings are several subdivisions. Pollution control costs can be broken down into water pollution and air pollution control costs. Each type of pollution control cost has two (main) cost categories, capital expenditures, operations and maintenance cost, raw materials cost and "other costs."

Output format:

These outputs contain all the information necessary to analyze the impacts on the industry. All output figures are in current dollars.

PTM (Steel) produces the following outputs:

1) Income Statement

2) Flow of funds summary

3) Balance sheet

User manaul: No
Systems documentation: No

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SECTION VI
EXPOSURE MODELS

1. AIR DOS-EPA
2. EXAMS
3. GLOBAL 79
4. HEP
5. MANTELAN
6. Multi, Model Fast Screen
7. MAXDOSE
8. MULTI80G
9. ONE HIT MG
10. RADRISK
11. RANK TIME
12. REPRISK
13. TOXFLO
14. WORKPLACE NOISE

(1)

Model acronym:	**AIR DOS-EPA**
Model name:	Atmospheric Dispersion of Radionuclides
Developer:	Oak Ridge National Laboratory
Contact:	David Fields
Contact address:	Oak Ridge National Lab., P.O. Box X, Oak Ridge, TN 37830
Contact telephone:	(615) 576-2131
Type of model:	Exposure
Summary:	Estimates annual intakes and exposures from the Atmospheric release of radionuclides.

Abstract:

AIR DOS-EPA is a model for estimating annual intakes and exposures from the atmospheric release of radionuclides. The purpose of the program is to provide these quantities as input to a companion program (DARTAB) to assess the individual or collective doses and risks associated with chronic releases of radionuclides. The model is a revision of AIR DOS-II (Mo77). Atmospheric dispersion, wet and dry deposition, and food pathway models are included. provisions are made for radionuclide chain ingrowth and decay, as well as environmental removal in the terrestrial portion of the model.

Document citations:

Begovich, C.L., Schlatter, E.C, Ohr, S.Y., Eckerman, K.R., DARTAB: A Program to Combine Airborne Radionuclide Environmental Exposure Data with Dosimetric and Health Effects Data to Generate Tabulations of Predicted Impacts, ORNL-5692 (to be published), 1980.

Moore, R.E., The AIRDOS-II Computer Code for Estimating Radiation Dose to Man from Radionuclides in Areas Surrounding Nuclear Facilities, ORNL-5345, 1977.

Moore, R.E, AIRDOS-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Dose to Man from Airborne Releases of Radionuclides, EPA 520/1-79-009, CRNL-5532, 1979.

U.S. Nuclear Regulatory Commission, Regulatory Guide 1.109, Calculations of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Revision 1, Office of Standards Development, 1977.

Principal users: It has been used by EPA and the Oak Ridge National Lab. for the radiological assessment of radionuclides released to the atmosphere.

Validation: OAQPS has not reviewed this model.

Assumptions:

Dispersion is calculated by a straight line, long-term average, Gaussian model. Momentum or buoyant plane rise can be calculated or assigned a value for each stability class. A dry deposition velocity and a precipitation scavenging rate can be specified for each radionuclide. A source depletion model accounts for plume depletion due to deposition. The terrestrial model includes environmental removal as well as a radiological decay. The food pathway model (vegetable, meat and milk) is consistent with that in Reg. Guide 1.109 (NRC77). Ingrowth for radionuclide chains subsequent to deposition can be calculated by providing a set of ingrowth factors. Air concentrations of short-lived radon-222 progeny are calculated in working level units for a specified value of equilibrium.

Output for DARTAB is in an unformatted file. The basic calculational methodology is that of AIRDOS-II with modifications for area sources, radon progeny concentrations, terrestrial ingrowth for radionuclide chains and an updated food pathway model.

Current implementation: Mainframe computer
Current hardware: Mainframe IBM 360, 370 or equivalent
Software language(s): FORTRAN IV (H extended)
Word size(s): 32-bit
Input requirements:

Model inputs include: grid size values; wind data; stack or area source data; radionuclide release rates, depositon and settling velocities, scavenging rates, and decay constants; arrays of meat animals, dairy cattle, crop areas, and population data for each grid location, fraction of each food category consumed from outside the assessment area, fraction of that consumed food produced within the assessment area which is produced of the grid location, ingestion, agricultural model parameters, ingestion rates by food category, inhalation rate; radionuclide decay and environmental removal rate constants from soil to vegetation, intake to meat, and intake to milk conversion factors, radionuclide chain ingrowth factors, clearance class, and gastrointestinal absorption fraction.

Output format:

Printed outputs available include: predicted air concentration; dry and wet deposition rates for each location and radionuclide; ground-level Chi/Q for each location by radionuclide; agricultural and population data for each grid location; list of nuclide-independent variables; list of computer totals of population, food production and food consumption for assessment area;

list of nuclide-dependent data for each nuclide; individual or population-weighted concentration and intake rates for each location by nuclide, radon-222 progeny concentration for each location; dose summaries (supplementary - not used for AIRDOS-EPA/DARTAB assessments). An unformatted file is created of concentration and intake data for each location to be used with DARTAB for a dose and risk assessment.

User manual:	Yes
Systems documentation:	Yes
Date of first version:	1977
Date of latest version:	1979
Date of latest documents:	1979
Analytical Features for Model:	Air Quality
Reactive pollutant:	No
Nonreactive pollutant:	Yes
Physical loss out of element:	Yes
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable reactive pollutants:	No
Point sources:	Yes
Linear sources:	No
Area sources:	Yes
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant: dispersion:	Yes
Multielement interactive:	No
Regional and subcontinental:	Yes
Localized:	Yes
Time scale: Hours:	No
Time scale: Days:	No
Time scale: Years:	Yes
Multielement not interactive:	Yes
Decay constants for the radionuclides:	Yes

(2)

Model acronym:	**EXAMS**
Model Name:	Exposure Analysis Modeling System
Sponsor:	EPA Environmental Research Laboratory, Athens
Developer:	Environmental Research Lab of EPA-ORD/Athens, GA
Contact:	Lawrence A. Burns
Contact address:	USEPA Athens Environmental Research Laboratory, College Station Road, Athens, GA 30613
Contact telephone:	(404) 546-3148
Availability:	Public
Type of model:	Toxic chemical exposure
Summary:	For rapid evaluation of toxic chemicals in aquatic ecosystems.

Abstract:

EXAMS is designed for rapid screening and evaluation of the behavior of toxic organic chemicals in aquatic ecosystems. Starting from a description of the chemistry of a toxicant, and the relevant transport and physical/chemical characteristics of the ecosystem, EXAMS computes:
Exposure: the ultimate (steady state) expected environmental concentrations (EECs) resulting from a specified pattern of (long-term, time-invariant) pollutant loadings.
Fate: the distribution of the chemical in the system and the fraction of the loadings consumed by each transport and transformation process.
Persistence: the time required for effective purification of the system (via export/transformation processes) once the pollutant loadings terminate.

The EXAMS program is an interactive modeling system that allows a user to specify and store the properties of chemicals and ecosystems, modify the characteristics of either via simple English-like commands, and conduct efficient, rapid evaluations and sensitivity analyses of the probable aquatic fate of synthetic organic toxicants.
EXAMS combines the loadings, transport and transformations of a toxicant into a set of differential equations by using the law of conservation of mass as an accounting principle. This law accounts for all the toxicant mass entering and leaving a system as the algebraic sum of (1) external loadings, (2) transport processes that export the compound from the system and (3) transformation processes within the system that degrade the toxicant to daughter products. The fundamental equations of the model describe the rate of change in toxicant concentrations as a balance between increases due to external and internally recycled loadings,and decreases due to transport and transformation processes.

Document citations:

Burns, L.A., et al., Exposure Analysis Modeling System (EXAMS): User Manual and System Documentation Report, (In preparation, draft supplied separately, or with software, on request), 1980.
Baughman, G.L., and Burns, L.A. "Transport and transformation of chemicals in environment: a perspective," O. Hutzinger (ed.) Handbook of Environmental Chemistry, Springer-Verlag, (in press), 1980.
Lassiter, R.R., Baughman, G.L., and Burns, L.A.,"Fate of Toxic Organic Substances in the Aquatic Environment,"S.E. Jorgensen (ed.) State of the Art in Ecological Modeling. Proceedings of the conference on Ecological Modeling, Copenhagen, Denmark, International Society for Ecological Modeling, Copenhagen, pp. 219-246, August 28-September 2, 1978.

Wolfe, N.L., Burns, L.A., and Steen, W.C., "Use of Linear Free Energy Relationships and an Evaluative Model to Assess the Fate and Transport of Phthalate Esters in the Aquatic Environment, Chemosphere, in press, 1980.

Validations: Medium

Assumptions:

EXAMS has been designed to evaluate the consequences of long-term, time-averaged toxicant loadings that ultimately result in trace-level contamination of aquatic systems. EXAMS generates a steady state, average flow field for the ecosystem. The model cannot evaluate the transient concentrated EECs that arise from spills of toxic chemicals. It is assumed that the toxicant does not itself radically change the environmental variables that drive its transformations of the light entering the system, and bacterial populations do not grow (or decline) simply due to the presence of the chemical. The validity of the method at high pollutant concentrations is uncertain. Sorption/desorption kinetics are assumed to be rapid, compared to other processes.

Word size(s): Disc storage bath; none interactive; look + 2K/chem +2.5 K/ENV

Input requirements:

Input parameters include:
A set of pollutant loading rates on each sector of the ecosystem.
Toxicant molecular weight, solubility and ionization constants.
Sediment sorption and biosorption parameters: Kp, Koc or Kow, biomasses, benthic water contents and bulk densities, suspended sediment concentrations, sediment organic carbon, ion exchange capcities.
Volatilization parameters: Henry's Law constant or vapor pressure data, wind-speeds, reaeration rates.
Photolysis parameters: quantum yields, absorption spectra, surface scalar irradiance, cloudiness, scattering parameters, suspended sediments, chlorophyll, dissolved organic carbon.
Hydrolysis: Second-order rate constants or Arrhenius functions for the relevant molecular species, pH pOH, temperatures.
Oxidation: rate constants, temperature, oxidant concentrations.
biotransformation: rate constants, temperature, total and active bacterial population densities.
Parameters defining strength and direction of advective and dispersive transport pathways.
System geometry and hydrology: volumes, areas, depths, rainfall, evaporation rates, entering stream and non-point-source flows and sediment loads, groundwater flows.
Although EXAMS allows for the entry of extensive environmental data, the model can be run with a much reduced data set when the chemistry of a toxicant of interest precludes some of the transformation processes. For example, pH and pOH data can be omitted in the case of neutral organics that are not subject to acid or alkaline hydrolysis reactions. An environmental "Canonical Database" is under development by EPA for eventual linkage to EXAMS.

Learning Difficulty: Medium/High

Output Interpretation difficulty: Medium

Geographic area:	estuary, lake, stream/river, wetlands
Analytical Features for Model:	water quality
Oxygen:	yes
Water temperature:	no
DO level:	no
Benthal oxygen:	no
Phosphorous:	no
Coliforms:	no
Chlorophyll-A:	no
Radioactivity:	no
Salinity:	no
Conservative minerals:	yes
Time dependent input:	no
Changes in channel flow:	no
Aeration:	yes
Respiration:	no
Photosynthesis:	no
Waste treatment plant input:	yes
Evaporation and precipitation effects:	yes
Time-variant pollution:	no
Point source:	yes
Nonpoint source:	yes
Steady state:	yes
Unsteady state:	no
Stream and river:	yes
Reservoir and lake:	yes
Estuarine:	yes
Ocean inlet:	no
Dam computation:	no
Mixing zones:	no

(3)

Model acronym:	GLOBAL 79
Model name:	Extra Solate Dichotomous Animal Carcinogenicity Data
Sponsor:	EPA
Developer:	Gary Grindstaff
Contact:	Gary Grindstaff
Contact address:	Office of Pesticides & Toxic Substances E617B Waterside Mall, 401 M Street, SW Washington, DC 20460
Contact telephone:	(202)755-6841
Availability:	User must have a registered account with EPA IBM
Type of model:	Exposure (Carcinogen)

Abstract:

GLOBAL 79 is a program to analyze dichotomous animal carcinogenicity data. It is assumed that, at each dose level, animals have been exposed to a constant dose rate of the agent under test and that some positive responses have occurred. The program calculates maximum likelihood estimates of a multistage dose response function. The user may allow the program to set the degree of the polynomial function to be one less than the number of dose groups, force the degree of the polynomial or globally maximize the likelihood over polynomials of arbitrary degree. A likelihood ratio test is then performed on the liner statistical confidence. Limits on risk are calculated for risk levels of 10(-1)....10(-8) and other dose levels input by the user. Finally, it requested by the user, the program will conduct a Monte Carlo goodness-of-fit test of the model to the experimental data.

Document citations:

Crump and Watson, A FORTRAN Program for Risk Assessment Using Dichotomous Dose Response, GLOBAL, 1979.

Both this program documentation and a number of theoretical papers are available from the technical contact. All users must have a registered account on the EPA IBM System and be familiar with the basic system conventions.

Principal users: EPA

Assumptions:

Limitation of the model: the number of dose levels must not exceed 19, the number of environmental doses input by the user must not exceed 50, the number of data sets which may be analyzed in one run must not exceed 1000.

This is a multistage model, the parameters of which are estimated by the method of maximum likelihood. However, the model is mathematically complex; thus rather than list them here, individuals interested in the assumptions and theory of this model are referenced to the technical contact for copies of theoretical papers underlying the development of this model.

Current implementation:	Mainframe computers
Feasible implementation:	Minicomputer
Current hardware:	IBM 370/168
Software language(s):	FORTRAN
Word size(s):	32 bit

Input requirements:

Inputs to this model include: the number of dose levels, goodness-of-fit option, number of animals at risk at each dose level, number of animals showing a positive response at each dose level, magnitude of each dose level, model option(multistage,forced stage, goal optimization), degree of polynomial (for forced stage option), number and level of environmental doses for which risks are to be computed.

Output format:

The principal outputs of the model are: lower statistical confidence limits for the dose producing extra risks of 10(-1), 10(-2).....10(-8) (virtually safe dose). Upper confidence limits on extra risk for maximum likelihood estimated doses (or other doses which are input by the user) corresponding to increased risks of 10(-1).....10(-8).

Source program storage:	300k
User manual:	Yes
Systems documentation:	Yes
Date of latest documents:	1979
Statutory authority:	Toxic Substances Control Act Section 5&6

(4)

Model acronym:	HEP
Model name:	Human Exposure Program
Developer:	Systems Applications, Inc., Contributions from Hydroscience Inc., Minimax Research Corporation
Contact:	Dave Patrick; George Duggan
Contact address:	US EPA Office of Air Quality Planning & Standards Strategies and Air Standards Division Research Triangle Park, NC 27711
Contact telephone:	(919) 541-5345/5420
Type of model:	Exposure
Summary:	Estimates population exposure to airborne pollutants emitted by point sources.

Abstract:

The Human Exposure Program (HEP) is a digital computer simulation which calculates population exposure to airborne pollutants emitted by point sources, using the concentration patterns of those pollutants. Additionally, the simulation determines the dosage (an integrated concentration x population) received by this exposed population. The purpose of the program is to estimate the impact of the emissions from a specific point source on the actual population in the neighborhood of the source. This program is not intended to certify a source as meeting a standard.

The Human Exposure Program computes the dosage received by an exposed population in the vicinity (within 20 km) of a specific point source which emits an airborne pollutant. The model also provides means for the analysis of the combined effects of sources and calculates the total dosage produced by these sources. HEP consists of several programs which carry out the calculations. Pollutant concentrations are obtained from a Gaussian dispersion model which uses meteorological data from over 300 Star-sites across the country. Population exposure is determined using 1980 Census Bureau population distribution estimates. Total dosage is obtained with the aid of interpolation algorithms to achieve a match of pollutant concentrations and population centroids. An ancillary program, STAR PICK, can be used to aid in selecting the star site whose meteorological conditions most closely approximate those of the location of the point source. A support program, UTM-CALC, is available to obtain the longitude and latitude of the source in degrees-minutes-seconds if the UTM coordinates are available.

Document citations:	Human Exposure to Atmospheric Concentrations of Selected Chemicals, Attachment 3. EPA Contract No. 68-023066, SAI No. EE-136 R, March 5, 1980.
Level of validation:	Reviewed and approved by OAQPS

Assumptions:

The Human Exposure Program assumes that the concentrations of the airborne pollutant can be described by a Gaussian dispersion model which uses averaged meteorological data for a 1-year period. The model assumes also that the pollutant is emitted at a constant rate over the entire year. Also, the density of the emissions is considered to be the same as the local atmosphere.

Human population is assumed to be distributed uniformly over each BG/ED (Block Group/Enumeration District) and population growth rates (required for periodic updates) are considered uniform over an individual county. The important feature of HEP is the interpolation algorithm - it is also the most important assumption because it considers a distribution of pollutant concentrations and a distribution of population that are reasonably smooth in the vicinity of a point source. The accuracy of the concentration to which each unit of population is exposed is as important to the accuracy of the total exposure as is the accuracy of the populations. Concentration patterns are input to HEP as polar grids with the source at the origin, the radial divisions (wind directions) oriented along the compass points, and the circular divisions (radii) spaced closely (0.1 km) near the source and less closely farther away. Since the population does not array itself neatly along these lines, a method for interpolating between concentration points was developed.

Current implementation:	Mainframe computer
Current hardware:	Mainframe UNIVAC 1110, LBL 6600/9600
Software language(s):	FORTRAN V, Standard FORTRAN IV
Word size(s):	36-bit
Number of subroutines:	21
Input requirements:	

Input to the model includes the geographical location of the point source, a Star-site whose meteorology is similar to that of the source desired (if not the nearest site is chosen) , and a description of the physical parameters of the source. These are the so-called "stack parameters" which are the emission rate, stack height, diameter and vertical cross-section area, effluent velocity and temperature, and the type of stack, i.e., vent or tall stack.

Output format:

HEP provides intermediate output, which can be suppressed, as well as "bottom-line" information about dosage which is usually of primary interest. Intermediate output includes pollutant concentrations around the point source and the distribution of population exposed to the airborne pollutant. Final output is the dosage (population x concentration) received by the exposed population for various concentration levels out to 20 km from the source.

Load module storage:	223 tracks; 45K memory - UNIVAC
Data storage:	600 tracks
User manual:	Yes
Systems documentation:	Yes
Date of first version:	1980
Date of latest documents:	1980
Machine interface:	Batch
Analytical Feature for Model:	Air Quality
Reactive pollutant:	No

Nonreactive pollutant:	Yes
Physical loss out of element:	No
Variable wind speeds:	Yes
Variable wind direction:	Yes
Variable inversion base height:	No
Variable reactive pollutants:	No
Variable incident sunlight:	No
Point sources:	Yes
Linear sources:	No
Area sources;	No
Complex topography:	No
Simple topography:	Yes
Vertical pollutant dispersion:	Yes
Crosswind pollutant dispersion:	Yes
Multielement interactive:	No
Single element:	Yes
Simultaneous pollutant introductions:	No
Regional and sub-continental:	No
Localized:	Yes
Time scale: Hours:	No
Time scale: Days:	No
Time scale: Years:	Yes
Decay function characterizing loss due to chemical reactions:	Yes
Variable stability:	Yes

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Model acronym:	MANTELAN
Model name:	Mantel-Bryan Low-Dose Extrapolation Model
Sponsor:	EPA
Developer:	Gary E. Grindstaff
Contact:	Gary E. Grindstaff
Contact address:	E617B Waterside Mall, 401 M Street, SW Washington, DC 21460
Contact telephone:	(202) 755-6841
Availability:	User must have a registered account with EPA IBM
Type of model:	Exposure

Abstract:

This computer model is an implementation of the technique for low-dose extrapolation developed by Mantel, Bohidar, Brown, Ciminera and Turkey in a 1975 paper entitled, "An Improved Mantel-Bryan Procedure for 'Safety' Testing of Carcinogens."

Document citations:

Available from the Technical Contract:
Example of Input to Run Mantel-Bryan Program
An Improved Mantel-Bryan Procedure for 'Safety' Testing of Carcinogens.
An unspecified number of theoretical papers.

Principal users: EPA

Assumptions:

Limitations not well known due to sparse documentation. The Mantel-Bryan model is a special case of the well-known probit model. Mantel-Bryan, however, assumes a slope of 1.0. The methods used to estimate parameters and to place confidence limits on dose are explained fully in a number of theoretical background papers available from the technical contact.

Current implementation:	Mainframe computer
Feasible implementation:	Minicomputer
Current hardware:	IBM 370/168
Software language(s):	FORTRAN
Word size(s):	32 bit

Input requirements:

Inputs to the model include: The assumed slope of the dose-response curve (usually 1.0), number of experimental groups (e.g., males, females), number of dose levels, number of confidence limits, chi-square values for desired confidence limits, dose levels, titles of experimental groups, number responders, number at risk for each control and treated group in each experimental group.

Output format:

The principal outputs of this model include lower confidence bounds for dose at specified attributable risks of 10(-1) to 10(-8). These estimates are presented for all dose groups first and then for successively smaller dose group combinations, eliminating the highest dose on each iteration.

Source program storage:	300K
User manual:	No
Systems documentation:	No
Statutory authority:	Toxic Substances Control Act (Sections 5 and 6)

AD-A133 265 FEASIBILITY STUDY FOR AN AIR FORCE ENVIRONMENTAL MODEL AND DATA EXCHANGE..(U) GENERAL SOFTWARE CORP LANDOVER MD S MCKENZIE ET AL. JUL 83 AFESC/ESL-TR-82-13-VOL-4 3/4

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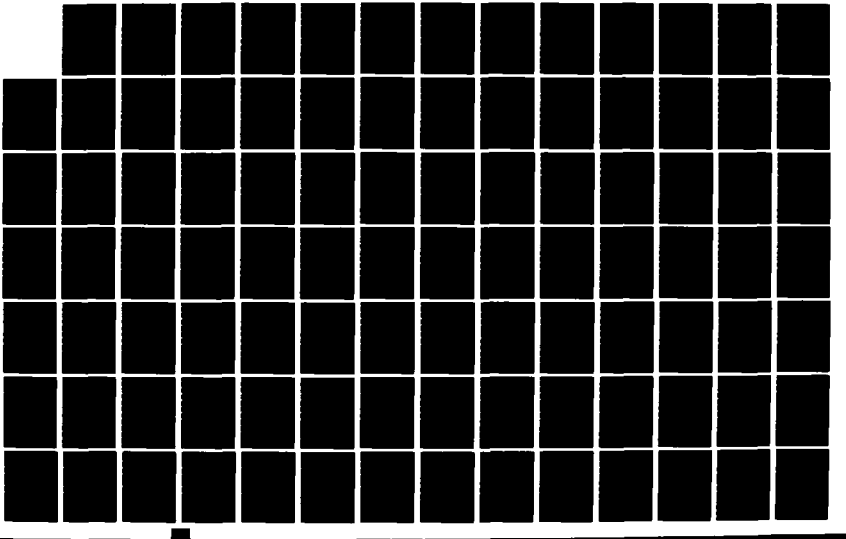

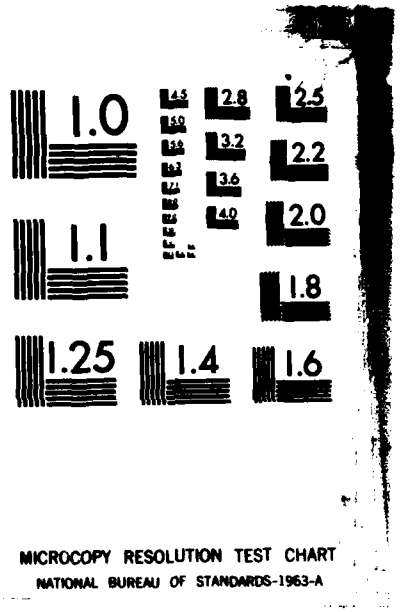

(6)

Model name:	A Mathematical Model for Fast-Screening Procedure for Testing the Effects of Pollutants in Mammals
Sponsor:	EPA
Developer:	Iltis & Miller
Contact:	Rumilt Iltis; Robert C. Miller
Contact address:	EPA-Health Effects Research Laboratory 26 West St. Clair Street Cincinnati, OH 45268
Contact telephone:	(513) 684-7417
Availability:	All users must have a registered account with the EPA IBM System
Type of model:	Exposure (Chemical)

Abstract:

The model offers an "on-line" method for measuring the effects of pollutants on respiratory efficiency in mammals, and it applies to any biological system in which the matter is transported through a well-defined compartment.

Since CO_2 excretion from the lungs (a measure of efficiency of respiratory function) has a well-defined distribution with time, it can be used for the prediction of effects by pollutants entering the body system. In this particular case, the model was derived for the prediction of the effect of ingested methylmercury (II) cloride on the excretion of (14) CO_2 from the lungs. This method reduces the observation period from several hours to only a few minutes. It is suggested that this model or a similar one can be used for measuring the efficiency of other body funtions, provided that there exists a measurable parameter that has a well-defined distribution with time.

Functional Capabilities: The model is in the form of a fourth-order differential equation, requiring a solution of eight equations. Using mathematical methods of approximation, the model can be fitted precisely to a two-parameter model of the form: $R=B^1t \exp(-B^2t)$, where R is the rate of excretion of (14) CO_2. In this form, only two measurements at the beginning of the experiment are required in order to predict the effects of the pollutants on respiratory function.

The measure of effects is the difference of cumulated (14)CO_2 excreted [R(+)= function $_0(t)$ R dt] between the control animals and the exposed animals.

Document citations:	Program documentation available from the technical contact
Principal users:	EPA
Validations:	Unknown

Assumptions:

It is assumed that a two-pool open system exists (Shipley and Clark, 1972) in which the blood pool is the central compartment, while the second pool is a conglomerate of peripherals such as the kidneys, lungs and liver. Peripheral pools can communicate only through the central compartment. If we ignore the dead space in the respiratory tract, then the lung can be considered as composed of two classical compartments (Rilel, 1965): the gas-exchange compartment and the anatomical dead space in the alveoli. The model is based on the fact that the blood is the vehicle by which the effect of an ingested toxicant, such as CH_3HgCl, is superimposed on all other peripherals, thus influencing the $(14)CO_2$ pattern. Each component is assumed to follow first-order kinetics in that the $(14)CO_2$ loss rate is taken to be proportional to the number of moles of the $(14)CO_2$ within a compartment. Actually, excretion from the blood pool is not linear (Piotrowski, 1971). But, as we assume, when steady state kinetics apply, the blood pool can also be treated as a classical compartment (Aris, 1966).

Current implementation:	Handbook, Programmable calculator, Maintrame computer
Feasible implementation:	Microcomputer, Minicomputer
Current hardware:	DEC 10
Software language(s):	User can choose
Word size(s):	36 bit

Input requirements:

The model requires only two measurements of $(14)CO_2$ from Cary vibrating reed electrometers in conjunction with ionization chambers. Output of the model is the total cumulative value of (14)C excreted and the percent or (14)C excreted.

Output complexity:	Low
Systems documentation:	Yes
Learning difficulty:	Low
User support:	No
Debugging maintenance:	No
Continued enhancement:	No

(7)

Model acronym:	MAXDOSE
Model name:	Maximum Individual Dose Model
Model number:	EPA No. M4203000002
Sponsor:	Office of Air, Noise and Radiation Office of Radiation Program, EPA
Developer:	EPA
Contact:	Barry L. Serini
Contact address:	USEPA Office of Air, Noise & Radiation Office of Radiation Programs, Criteria Stand. Div. Crystal Mall #2, 1921 Jefferson Davis Highway Arlington, VA 22202
Contact telephone:	(703)577-7604
Type of model:	Exposure (Radiation)
Summary:	Calculate accidental releases from a nuclear waste repository.

Abstract:

The Maxdose code calculates accidental releases from a nuclear waste repository. Both geological and human events are modeled. Each event produces a given set of dose rates at different times and distances. Both leaching and dissolution remove wastes from the matrix into the accessible environment. The release is used to calculate the dose table.

The code can calculate the dose for up to 10 distances, 13 dose times and 20 nuclides per run. All transport models are two-dimensional, yielding the highest dose along the centerline. Error on numerical integration is less than 10% using cautious adaptive Romberg extrapolation.

Document citations:	MAXDOSE-EPA User's Manual
Validations:	Not reviewed by OAQPS

Assumptions:

For atmospheric releases, Maxdose uses AIRDOSE equations; no direction is specified for the wind. Water releases are calculated along the centerline where the maximum concentration occurs. Area calculations assume parabolic distribution for contaminates in the groundwater and a circular distribution for air releases.

Current implementation:	Mainframe computer
Current hardware:	Mainframe IBM 360
Software language(s):	FORTRAN
Word size(s):	Magnetic tape storage any 132 positions per line

Input requirements:

Input to model included initial inventories of waste, their half-lives, retardation factors, three sets of dose conversion factors, solubilities, bioaccumulation factors. The boreholes and the flow through the boreholes are modeled. Permeability and its rate of change are input numerical constants for approximating the gradient, the canister life, leach rate, groundwater velocity, size of tank, porosities, dose times and distances.

Output format:

Output consists of an echo check of the input data in a standard format. A table of dose rates at various dose times and distances, and areas contaminated by given event,are presented.

User manual:	Yes
Model:	Exposure Models
Noise:	No
Ventilation:	No
Chemical:	Yes
Lights:	No
Radiation:	Yes
Other:	No
Waste tracking:	Yes
Occupational health:	No

(8)

Model acronym:	MULTI80G
Model name:	A Computer Progam for the Risk Assessment of Toxic Substances
Sponsor:	EPA
Developer:	Gary Grindstaff
Contact:	Gary Grindstaff
Contact address:	Office of Pesticides & Toxic Substances E617B Waterside Mall 401 M Street, SW Washington, DC 20460
Contact telephone:	(202) 755-6841
Availability:	Users must have a registered account on the EPA IBM
Type of model:	Exposure (Chemical)

Abstract:

This program was developed for generating carcinogenic risk assessments of toxic substances based on the generalized low-dose multihit and one-hit does-response functions applied to animal response data derived from lifetime feeding studies.

Document citations:

Rai, K., and Ryzin, J. V., A Computer Program for Risk Assessment of Toxic Substances, Rand Corporation, Santa Monica, CA, June 1980.
Several theoretical papers, including this documentation and method of access to the model at WCC, are available from the technical contact.

Principal users: EPA

Assumptions:

Limitation of the model: There must be at least two positive (nonzero) dose levels. There may be no more than 14 positive dose levels. The average run time may vary for the same job by as much as +20%.

This model is based on a gamma distribution. However, it is mathematically quite complex; thus, rather than list assumptions here, individuals interested in the underlying assumptions are referred to the technical contact for copies of theoretical papers underlying the development of the model.

Current implementation:	Mainframe computer
Feasible implementation:	Minicomputer
Current hardware:	IBM 370/168
Software language(s):	FORTRAN
Word size(s):	32 bit

Input requirements:

The inputs to the model are: the number of positive (nonzero) dose levels in the bioassy, magnitude of each dose level, total numbers of animals on test at each level and total numbers of animals with tumor types of interest at each dose level.

Output format:

The principal outputs of interest from the model are: a chi-square goodness-of-fit test, an estimate of the number of "hits" required to initiate a carcinogenic response, and point estimates and 90-, 95-, 97.5- and 99.5-percent lower confidence limits on "virtually safe dose" for risks from 1 in 10 to 1 in 100,000,000.

Source program storage:	330K
User manual:	yes
Systems documentation:	Yes
Date of latest version:	1980
Date of latest documents:	1980
Statutory authority:	Supports regulatory actions under Sections 5 and 6 of TSCA

(9)

Model acronym:	ONE HIT MD
Model name:	One-Hit Lose-Dose Extrapolation Mode
Sponsor:	EPA
Developer:	Gary Grindstaff
Contact:	Gray Grindstaff
Contact address:	E617B Waterside Mall 401 M Street, SW, Washington, DC 20460
Contact telephone:	(202) 755-6841
Availability:	User must have a registered account on the EPA IBM
Type of model:	Exposure

Abstract:

This program computes maximum likelihood estimates of the parameters of the one-hit model. Abbott's connection is incorporated so that estimates of increased risk may be generated. The parameters generated by the model are used in the assessment of lifetime carcinogenic risks at low environmental doses.

Document citations:

Systems documentatin available from the technical contact.

Principal users: EPA

Assumptions:

The limitations of the model are: the number of experimental clauses must not exceed 10; the number of dose levels must not exceed 20; other limitations, if any, are unknown.

The theory of the one-hit model says that there is some risk of cancer from even a slight exposure to a carcinogen, and that the experimental probability law gives the probability that a carcinogen at a given dosage will induce cancer in a laboratory animal. The detailed, mathematical assumptions underlying this model are provided in the program documentation, available from the technical contact.

Current implementation:	Mainframe computer
Feasible implementation:	Minicomputer
Current hardware:	IBM 370/168
Software language(s):	FORTRAN
Word size(s):	32 bits

Input requirements:

Inputs to the model include: number of experimental groups (e.g., males, females), number of dose levels, chi-square values for derived confidence limits, dose levels, titles of experimental groups, number of responders, number at risk for each control and treated group on each experimetnal group.

Output format:

The principal outputs of this model include: lower confidence limits for dose at specified attributable risks of 10(-1) and 10(8), lower confidence limits on the one-hit parameter. These estimates are presented for all dose groups first and then for successively smaller dose group combinations, eliminating the highest dose of exposure.

Source program storage:	300K
User manual:	Yes
Systems documentation:	Yes
Statutory authority:	Toxic Systems Control Act (Section 5&6)

(10)

Model acronym:	RADRISK
Model name:	Radionuclide Dose Rate/Risk
Sponsor:	EPA
Developer:	EPA Office of Radiation Programs
Contact:	R.E. Sullivan
Contact address:	US EPA Office of Air, Noise and Radiation Office of Radiation Programs, CSD 1921 Jefferson DavisHwy, Arlington, VA 22202
Availability:	Public
Type of model:	Exposure (Radiation)

Abstract:

RADRISK is a model designed to estimate the health risk due to inhalation or ingestion of radionuclides for arbitrary exposure periods. The end result of the system is a set of values relating fatal cancers and genetically significant radiation doses to a unit intake of radionuclides. The model is a greatly revised combination of two previously existing programs--INREM II and CAIRD. The health risk from external exposures is also estimated by the CAIRD model using dose rates from a separate model--DOSFACTER.

Functional Capabilities: RADRISK calculates the radiation dose rates and estimated fatal cancers resulting from the chronic inhalation or ingestion of one pico Curie/yr of radioisotope. All radioactive decay products of the parent isotope are also considered. Dose rates are calculated over a 110-year period for 18 organs. Cross irradiation dose rates are incorporated using Monte Carlo results from the S-factor model. These dose rates are then combined in a life table, using US population mortality rates, to compensate for competing risks in estimating radiation health effects. External dose rates, taken from DOSFACTOR, are treated similarly in the life table analysis. An integration of the gonadal dose rate is also perfomed to obtain the 30-year genetically significant dose. Input units are pico Curies/yr, pico Curies or squared centimeter pico Curies/cubed centimeter. Dose rates are given in mrad/yr for both high-and low-LET radiation and the life table returns estimated premature deaths to a cohort of 100,000 for each cancer.

Document citations:

RADRISK (to be published)

Dunning, D.E., Jr., et al., S-FACTOR: A Computer Code for Calculating Dose Equivalent to a Target Organ per Microcurie-Day Residence of a Radionuclide in a Source Organ, 1977.

Cook, J.R., et al., CAIRD: A Computer Code for Cohort Analysis of Increased Risks of Death, EPA 520/4-78-012, 1978.

Kocher, D.C., DOSFACTER: Dose-Rate Conversion Factors for External Exposure to Photon and Electron Radiation from Radionuclides Occurring in Routine Releases from Nuclear Fuel Facilities, ORNL/NUREG/TM-283, 1979.

Principal users: Oak Ridge National Laboratory and EPA

Assumptions:

The dose rate calculational model incorporates the International Commisison on Radiological Protection (ICRP) lung and gastrointestinal tract models and uses exponential retention functions and standard metabolic parameters for the post blood organs. Nonexponential retention functions are fitted, by means of an auxiliary program, to an exponential series of up to five terms. The life table calculation is based on a cohort. At present, no age dependence is allowed in the dose rate or risk may be age-adjusted.

Current implementation:	Mainframe
Feasible implementation:	Minicomputer
Current hardware:	IBM 360/370
Software language(s):	FORTRAN
Word size(s):	32 bit

Input requirements:

Input required for the dose rate portion of the code includes the physical (half-life, energy) and metabolic (transfer fractions, retention functions) data for the parent and each daughter product. The life table calculation, in addition to the time dependent dose, requires specifications of the risk, including latency and plateau periods, associated with the radiation. For relative risk cases, mortality rates must be supplied for each cancer to be considered.

Output format:

Normal output comprises the total dose rate, for both high- and low-LET radiation, to each of 18 organs at the midpoint of specified time intervals. Options are available for printing out each daughter contribution as well as the cross-irradiation terms. The integrated, genetically significant dose to the gonads, along with an average value, is also output. The life table calculation outputsthe number of premature deaths, the average years of life lost for each, and the decrease in overall life expectancy for each cancer type as well as the totals.

Load module storage:	500 K bytes
User manual:	Not yet
Systems documentation:	No

(11)

Model acronym: RANK TIME
Model name: A FORTRAN Program for Risk Assessment Using Dose - Response Data Time-to-Occurrence
Sponsor: EPA
Developer: Gary Grindstaff
Contact: Gary Grindstaff
Contact address: Office of Pesticides and Toxic Substances
E617B Waterside Mall
401 M Street SW, Washington, DC 20460
Contact telephone: (202) 755-6841
Availability: User must have a registered account with the EPA IBM
Type of model: Exposure

Abstract:

The program RANK implements the theory developed in a 1980 paper by Daffer, Crump and Masterman entitled, "Asymptotic Theory for Analyzing Dose-Response Survival Data with Applications to the Low-Dose Extrapolation Problem" -- (to appear in Mathematical Biosciences) for analyzing dose-response time-to-occurrence data and for estimating low-dose risks from such data. This method is based on the multistage model. The data are derived from lifetime feeding studies with animals, usually rodents.

Document citations:

Rank: A FORTRAN Program for Risk Assessment Using Time-to-Occurrence Dose-Response Data by Crump, Howe, Masterman and Watson (1980). Both this program documentation and a number of theoretical papers are available from the technical contact.

Principal users: EPA

Assumptions:

Limitations to the model: the number of dose groups must be greater than 2 and less than 10, the number of animals must not exceed 1000, the degree of the polynomial must not exceed 11, the number of animals that die of cancer must be less than 300.

This model is a variant of the multistage model with death time included as an additional parameter. However, the model is mathematically quite complex; thus, rather than list them here, individuals interested in the underlying assumptions are referred to the technical contact for copies of theoretical papers underlying the development of this model.

Current implementation: Mainframe computer
Feasible implementation: Minicomputer
Current hardware: IBM 370/168
Software language(s): FORTRAN
Word size(s): 32 bits
Operating system(s):

Input requirements:

The inputs to the model include: number of dose groups, number of animals in each treatment group, dosages administered to each treatment group, times of death for which confidence limits are to be computed, time of death of each animal, degree of polynomial of multistage model, cutoff time for ignoring cancer deaths, method of ties among cancer deaths.

Output format:

Based on a number of estimates and the asymptotic theory developed in the 1980 Daffer et al. paper, estimates and confidence limits are calculated for a number of questions. These include: the risk $P(t,d)$ at time t from dose d, the extra risk $P(t,d)-P(t,o)$ at time t from dose d, the safe dose corresponding to time t and additional risk, the expected fraction of life shortening by the t from dose d.

Source program storage:	300 K
User manual:	Yes
Systems documentation:	Yes
Statutory authority:	Toxic Substances Control Act (Sections 5 and 6)

(12)

Model acronym:	REPRISK
Model name:	High-Level Radioactive Waste Repository Risk Model
Sponsor:	EPA, Office of Radiation Program
Contact:	C. Bruce Smith
Contact address:	US EPA, Office of Air, Noise and Radiation Office of Radiation Programs Criteria and Standards Division Crystal Mall #2, 1921 Jefferson Davis Highway Arlington, VA 22202
Contact telephone:	(703) 557-7604
Availability:	Public
Type of model:	Exposure (Radiation)

Abstract:

This computer code calculates the expected genetic and somatic health effects at a generic high-level radioactive waste geologic repository. The code calculates radionuclide releases to air, land surface and rivers or lakes from a repository as a result of expected events and accidental events. The accidents are human intrusion (drilling), breccia pipes, faults, meteorites and volcanoes. The expected events are shaft and borehole leakage and bulk rock transport. The releases result either from destruction of waste packages or disturbances of the contaminated repository backfilled tunnels, the concentration of radioactivity in dissolution of radionuclides (solubility), and the characteristics of the waste matrix and canisters. Movement of contaminated water in the tunnels is either directed to land surface or to aquifers overlying the repository. Movement of the radioactivity in the aquifer is governed by groundwater flow in the aquifer and retardation of radionuclides in the aquifer.

The model calculates the total release of radionuclides over a time period and converts these releases to health effects. To calculate releases, the flow rate of radioactivity in curies per year is integrated either analytically or numerically over the time period of interest. The numerical integrator is 90% accurate. Flow in the aquifer is one-dimensional nondispersive. The tunnel mixing volume is assumed homogeneous. Parameters are constant over all time, but flow rates of water from the repository are time-dependent. The health effects are combined with event probabilities to calculated probability consequence curves and overall risk.

Document citations:

Smith, C.B., Egan, D.J., Williams, W.A., Gruhlke, J.M., Hung, C.Y., Serini, B., Population Risk from Disposal of High-Level Radioactive Waters in Geologic Repositories, EPA/520/3-80-006, 1980.

Smith, J.M., Fowler, T.W., and Golding, A.S., Environmental Pathway Models for Evaluating Population Risks from Disposal of High-Level Radioactive Wastes in Geologic Repositories, EPA 520/5-80-002, 1980.

Principal users: EPA/ORD

Assumptions:

1) Dimensional nondispersive aquifer, 2) homogeneous mixing volumes whose radionuclide concentrations can be described by first-order differential equations, 3) input parameters are constant over all time, 4) Probabilities of accident events are constant over various time bands and can be input.

Current implementation: Mainframe computer
Feasible implementation: Minicomputer
Current hardware: IBM 370
Word size(s): 32-bit

Output format:

Two types of output are available for somatic health effects, genetic health effects or release limit ratios: 1) integrated risk or release limit ratios, 2) probability consequence curves.

User manual: In preparation
System documentation: No

(13)

Model acronym:	TOXFLO
Model name:	Urban Wastewater Toxics Flow Model
Sponsor:	EPA
Contact:	Lewis Rossman
Contact address:	US EPA Municipal Environmental Research Lab. 26 West St. Clair Street Cincinnati, OH 45268
Contact telephone:	(513) 684-7636
Availability:	Public
Type of model:	Exposure (Toxic Chemical)
Summary:	Statistical estimation of toxic pollutants in a municipal sewage treatment system.

Abstract:

The Urban Wastewater Toxics Flow Model permits statistical estimation of the generation and fate of toxic pollutants entering into a given municipal sewage treatment system. Quantities computed by the model include flow and concentration values from each controllable industrial discharger, flow and concentration values from the domestic/commercial sector, quality of the influent, effluent, and sludge from the municipal sewage treatment plant, and receiving stream water quality. The model can be run to compute either statistical confidence limits for the mean values of these quantities or to predict the frequency distribution of the daily performance of a system (e.g., how often will water quality criteria by violated?). The model can aid in developing industrial pretreatment programs by indicating which industrial dischargers and toxic pollutants may be problematic under existing levels of treatment, and what impact alternative industrial pretreatment/ municipal treatment technologies may have in controlling toxic pollutants. The program is run in time-sharing mode over an interactive terminal.

Doocument citations:	User manual in preparation
Principal users:	EPA

Assumptions:

The model assumes statistical independence between all industrial discharges and between the performance of the municipal treatment plant and the flow in the receiving stream. The frequency distribution of all input quantities must be either normal, lognormal or beta distributed. Serial correlations in time of these quantities are not considered. Municipal treatment plant removal capabilities may be described as deterministic functions of influent concentration coupled to a random error team.

Current implementation:	Mainframe computer
Current hardware:	Mainframe DEC PDP 11/70
Software language(s):	FORTRAN

Input requirements:

Input to the model consists of means and standards deviations for the flow and concentration of each pollutant of interest from each industrial discharger, and for the concentrations attributed to domestic/commercial

sources. A set of pollutant removal functions and their standard errors are required for the municipal treatment plant. The mean and standard deviations of the receiving stream flow are also needed. There is a possibility that at some future date, an internal data base will be added to the model so that the input can be reduced to specifying industrial subcategory types, pre-treatment technologies, and municipal treatment technologies.

Output format:

Standard output from TOXFLO consists of the estimated means of the concentrations of each toxic pollutant in the influent, effluent and sludge of the municipal plant and of the receiving water. Also, reported is the possibility or frequency with which water quality and sludge quality criteria are violated. The user can request that a more detailed inventory report be printed for a specific pollutant. This report will contain the first four months of the flow, concentration, and mass loading from each discharge source and similar statistics for the concentrations at the municipal treatment plant and in the receiving stream. External to the program, the user may then use this information to assume distribution types for the quantities of interest and then develop confidence limits or determine percentile values.

Machine interface:	Time-sharing mode over an interactive terminal.
Geographic areas:	Estuary, lake, stream/river

Analytical Features for Model:	Water Quality
Oxygen:	No
Water temperature:	No
DO level:	No
Benthal oxygen:	No
Phosphorous:	No
Coliforms:	No
Chlorophyll-A:	No
Radio activity:	No
Salinity:	No
Conservative minerals:	No
Time dependent input:	No
Changes in channel flow:	No
Aeration:	No
Respiration:	No
Photosynthesis:	No
Waste treatment plant input:	Yes
Evaporation and precipitation effects:	No
Time-variant pollution:	Yes
Point source:	Yes
Nonpoint source:	No
Steady state:	Yes
Unsteady state:	Yes

Stream and river:	No
Reservoir and lake:	No
Estuarine:	No
Ocean inlet:	No
Dam computations:	No
Mixing zones:	No

(14)

Model name:	Workplace Noise Evaluation Model
Sponsor:	EPA
Developer:	Roger Heymann
Contact:	Roger Heymann
Contact address:	US EPA, Office of Noise Abatement and Control Crystal Mall #2, 1921 Jefferson Davis Highway Arlington, VA 22202
Contact telephone:	(703) 557-2621
Availability:	Still in development.
Type of model:	Exposure (Workplace Noise)

Abstract:

Model assesses the occupational noise impact in industrial factory spaces. Model determines the daily noise dose of exposure for each class of production workers, and determines the contributions of each machine to this dose. It will identify the benefits to be gained in terms of reduced exposure from reducing noise levels of one or more machines.

Functional Capabilities: A weighted sound level and statistical confidence limits are calculated.

Principal users: EPA

Assumptions:

Worker activities can be characterized by a common work assignment schedule. Noise levels generated by similar equipment are normally distributed. Primary contributor to noise exposure is the machine being operated by operator in question. Secondary sources are grouped into the background level with appropriate weighting factors.

Current implementation:	Minicomputer; Mainframe computer
Current hardware:	IBM 360
Software language(s):	FORTRAN IV
Word size(s):	32 bit
Input requirements:	Worker job assignments; number of workers; machinery noise levels at operator locations.

Output format:

- OSHA - personnel noise exposure by job description and industry
- Distribution of noise exposure by job description, i.e., mean and worst case
- Rank ordering of noisy machines by contribution to noise exposure
- Calculation of minimum noise reduction requirements to meet OSHA
- Same for EPA, except impact applies rather than exposure.

Analytical Feature for Model: Noise

SECTION VII
NOISE MODELS

1. Acoustic Impact Prediction
2. CSM
3. Michigan Highway
4. NOISEMAP
5. Strategy Model
6. Workplace Noise

(1)

Model name:	Acoustic Impact Prediction Model: Forest Facility Noise Model
Sponsor:	EPA
Developer:	Eugene Wyszpolski
Contact:	Eugene Wyszpolski
Contact address:	USEPA, Office of Noise Abatement and Control Crystal Mall #2 1921 Jefferson Davis Highway Arlington, VA 22202
Contact telephone:	(703)557-2127
Type of model:	Noise

Abstract:

MODEL OVERVIEW: This model is an engineering and psychological model to aid in laying out forest facilities as a function of noise-producing elements.

FUNCTIONAL CAPABILITIES: The model is based on a detectability model developed for the military. The accuracy of the model is heavily dependent on the input which may be accurately measured on generally estimated.

Document citation:

Predicting Impact of Noise on Recreationists Project Record - USDA - Forest Service - 8023 - 1202, April 1980.

Principle users: U.S. Park Service; Forest Service; State and local parks personnel

Assumptions:

The model is based on personal annoyance. The detectability and annoyance factors are considered in utilizing the model results in laying out a forest/park for its many appropriate uses.

Current implementation: Calculator

Input requirements:

INPUT: Input data required:

-sound source location
-listener atmospheric temp
-mean atmospheric temp
-mean elevation
-mean wind direction
-sound source description
-background sound source description
-highest barrier, height, distance
-predominant vegetation type
-recreation opportunity
- mean wind angle
- day/night
-mean relative humidity
-exp. sky cover
-wind speed

Output format:

OUTPUT: The output products of this model is the detectability and annoyance levels of noise in decibels (dB).

Analytical Feature for Model:	Noise
Aircraft noise:	No
Highway noise:	No
Construction noise:	No
Urban noise:	No
Aircraft types:	
Transport fighters:	No
Propeller-driven:	No
Specific aircraft:	No
Aircraft descriptors:	
Detailed performance:	No
Variation in power:	No
Dispersion in flight path:	No
Atmospheric variation:	No
Point:	Yes
Area:	No
National exposure:	No
Loudness level:	Yes
Plotted contours as output:	No
Forest facility noise simulation:	Yes

(2)

Model acronym:	CSM
Model name:	Construction Site Health and Welfare Model
Sponsor:	EPA
Developer:	John H. Fuchs
Contact:	John H. Fuchs
Contact address:	USEPA, Office of Noise Abatement and Control Crystal Mall #2, Room 1101 1921 Jefferson Davis Highway Arlington, VA. 22202
Contact telephone:	(703)557-7666
Availability:	No outside use allowed unless designated by Office of Noise Abatement
Type of model:	Noise

Abstract:

The model computes noise impacts on the population surrounding the more than two million construction sites that are active every year in the U.S. In addition, it evaluates the benefits accruing to the various populations affected by construction site noise as a result of individual and combined regulations for one or more of the operational types of equipment.

FUNCTIONAL CAPABILITIES: The complete model contains the following:

1. Time stream

2. Curve

3. Output of impact reduction

4. Distribution of Level Weighted Population (LWP) and population exposed with respect to 1 decibel (1dB) level of noise day-high average (Ldn) intervals.

5. Usage factors

6. Duration of construction site activity

7. Daytime population density shifts.

Principal Users:	EPA
Current Implementation:	Minicomputer; mainframe computer
Current hardware:	IBM 370/168
Software Language(s):	FORTRAN
Word size(s):	32 bit

Input requirements:

1) Noise levels of construction equipemnt, 2) Equipment usage factors, 3) Number of construction sites by the type of site and by population density category, 4) Population density, and 5) Duration of construction activity by phase of construction.

Output format:

1) Yearly Ldn, 2) equivalent sound level, 3) population exposed, 4) level-weighted population (LWP), 5) sound propagation distance to criteria levels, and 6) relative change in impact (Relative Lwp, LWP/LWP1) change in impact.

Analytical Feature for Model:	Noise
Aircraft noise:	No
Highway noise:	No
Construction noise:	Yes
Urban noise:	No
Aircraft types:	
Transport fighters:	No
Propeller-driven:	No
Aircraft descriptors:	
Detailed performance:	No
Variation in power:	No
Dispersion in flight path:	No
Atmospheric conditions:	No
Point:	Yes
Area:	No
National exposure:	No
Loudness level:	Yes
A-weighted sound levels:	Yes
Plotted contours:	No

(3)

Model name:	**Michigan Highway Noise Program**
Sponsor:	Society for Computer Applications in Engineering Planning and Architecture, Inc.
Availability:	Disk ($250) Cards ($350)
Type of model:	Noise

Abstract:

This program allows the user to rapidly determine L_{50}, L_{10}, L_{eq}, L_{np} and TNI noise levels at any specified distances from the highway for any combinations of the design options available - pavement elevation variables, barrier variables, surface types, grades, etc.

The program prints out intermediate results such as the L_{10} for automobiles (L10A), the L_{10} for tracks (L10T) and a total L_{10} for each lane group of each roadway element.

Overall L_{50}, L_{10}, L_{eq}, L_{np} and TNI noise level predictions resulting from all roadway elements are then printed along with the distance (DN) to the last element comprising the site. These noise levels are rounded to the nearest dBA.

Two sample problems are available to acquaint the user with expected program operation. The input data and site configurations have been designed to test most of the program features and may not represent a true to life situation. Prospective users can use the results to insure proper operations on their respective computer systems.

Principal user:	Michigan Highway Dept.		
Current implementation:	Mainframe computer		
Current hardware:	META-4/1130 Burroughs		
Software language(s):	FORTRAN		
Operating System(s):	DNA T50		
Lines of source code:	800		
Output format:	Calcomp plots - noise levels; tabular output		
User manual:	Yes		
Machine interface:	Interactive		
User support:	Limited		
Analytical feature for Model:	Noise	National exposure:	No
Aircraft noise:	No	Loudness level:	Yes
Highway noise:	Yes	A-weighted sound levels:	No
Construction noise:	No	Contour plotting:	No
Urban noise simulation:	No		
Aircraft types:			
Transport fighters:	No		
Propeller driven:	No		
Aircraft desciptors:			
Variation in power:	No		
Dispersion in flight path:	No		
Atmospheric variation:	No		
Point:	Yes		
Area:	No		

(4)

Model acronym:	NOISEMAP
Model name:	NOISEMAP
Sponsor:	Aerospace Medical Research Lab., Aerospace Medical Div., Air Force Systems Command, Wright-Patterson, AFB, OH 45433 Jerry Speakman
Developer:	Bolt Beranek and Newman Inc.
Contact:	Harry Seidman
Contact address:	21120 Vanowen St., Canoga Park, CA 91303
Contact telephone:	(213) 347-8360
Availability:	Public-cost $100-$200
Type of model:	Noise
Summary:	Calculates noise exposure levels around air bases.
Abstract:	

The NOISEMAP computer program is a comprehensive set of computer routines for calculating noise exposure contours for airport operations. The program was developed by Bolt Beranek and Newman under sponsorship of the U.S. Air Force. The program permits calculation of the noise environment in terms of day-night level (DNL), noise exposure forecast (NEF) or community noise equivalent levels (CNEL). With simple modification of input data, NOISEMAP also can develop noise level contours, typically in terms of effective perceived noise level (EPNL) or sound exposure level (SEL), for individual aircraft operations.

Document citations:

Bishop, D.E., Community Noise Exposure Resulting from Aircraft Operation: Application Guide for Predictive Procedure, Air Force Report AMRL-TR-73-105, (AS A004818), November 1974.

Galloway, W.J., Community Noise Exposure Resulting from Aircraft Operations: Technical Review, Air Force Report ARML-TR-73-106, (AD A017741), Nov. 1974.

Bishop, D.E., and Galloway, W.J., Community Noise Exposure Resulting from Aircraft Operations: Acquisition and Analysis of Aircraft Noise and Performance Data, Air Force Report AMRL-TR-73-107, (AD A017741), August 1975.

Reddingius, N.H., Community Noise Exposure Resulting from Aircraft Operations: Computer Program Operator's Manual, Air Force Report AMRL-TR-73-108, (AD 785360), December 1978.

Beckmann, J.M. and Seidman, H., Community Noise Exposure Resulting from Aircraft Operations: NOISEMAP 3.4 Computer Program Operator's Manual, Air Force Report AMRL-TR-78-109, (AD A0 68518/GA), December 1978.

Speckman, J.D., Powell, R.G., and Cole, J.N., Community Noise Exposure Resulting from Aircraft Operations: Accoustic Data on Military Aircraft, Air Force Report AMRL-TR-73-110, November 1977.

Vol.1 - Acoustic Data on Military Aircraft (AD A053699).
Vol.2 - Air Force Bomber/Cargo Aircraft (AD A053700).
Vol.3 - Air Force Attack/Fighter Aircraft (AD A053701).
Vol.4 - Air Force Trainer/Fighter Aircraft (AD A053702).
Vol.5 - Air Force Propeller Aircraft (AD A055079).
Vol.6 - Navy Aircraft (AD A056217).

Principal users:	USAF, AFESC Tyndall AFB, Bolt Beranek and Newman, Inc.
Validations:	High
Current implementation:	Mainframe computer
Current hardware:	CDC 6600's & CDC 170's
Software language(s):	FORTRAN (CDC) 95%, Compass (CDC) 5%
Word size(s):	60
Operating system(s):	NOS/BE, NOS< SCOPE 3.4
Lines of source code:	20,000
Number of subroutines:	105
Input requirements:	Indentified in operator's manual.
Input databases:	USAF NOISEFILE 4.1
Data update frequencies:	Continuous

Output format:

Gridded values, printer plots. When used with Calcomp's CPCPII-line contours. When used with CACI SITE #-demographic information.

Output complexity:	Low
Load module storage:	171 400 B
User manual:	Yes
Systems documentation:	No (minimal)
Date of first version:	1974
Date of latest version:	1981
Date of latest documents:	1980
Machine interface:	Batch
Learning difficulty:	Medium
Continued enhancement:	Yes
Confidentiality:	Not classified
Statutory authority:	USAF

(5)

Model acronym:	RDM
Model name:	Decision Model
Sponsor:	EPA
Developer:	Kurt Askin
Contact:	Kurt Askin
Contact address:	US EPA, Office of Noise Abatement & Control 1921 Jefferson Davis Highway Crystal Mall #2, ANR-471 Arlington, VA 22202
Contact telephone:	(703)557-9300
Type of model:	Noise (Cost Benefit)

Abstract:

The Decision Model permits analysis of the benefits and costs of noise regulation. It elucidates prominent regulatory options according to time-phased implementations, uniform annualized costs, average annual individual benefit metrics by baseline impact, change in input, and output from the "Health and Welfare Model."

The Decision Model computes all possible combinations of a given product's subcategories, applicable standards, and lead-time, and calculates costs and benefits for each such combination. It then draws a curve combining a subset of these combinations similar to Pareto optimality conditions.

Principle users:	EPA
Current implementation:	Minicomputer, mainframe computer
Current hardware:	IBM 370
Software language(s):	FORTRAN
Word size(s):	32 bit

Input requirements:

INPUT: Machine Type
Growth Rates for Equipment Types
Noise Levels, pre and post regulation
D&M Costs/Yr. of Timestream
Prices
Equipment Life Cycles
Capital Investment Costs
Plant Closings
Unemployment
Output from EPA Health and Welfare
Models
Population data of Regulated
Models and Costs of Regulation

Output format:

Benefit summary measures (cumulative benefit, average benefit, discounted benefits), option cost measures, (cumulative cost, average cost, discounted costs), manufacturer cost summary measures (capital investment, average and cumulative, discounted), and unemployment summary measures (cumulative, average).

(6)

Model name:	Strategy Model
Sponsor:	EPA
Developer:	Kurt Askin
Contact:	Kurt Askin
Contact address:	USEPA, Office of Noise Abatement & Control Crystal Mall #2, ANR-471 1921 Jefferson Davis Highway Arlington, VA 22202
Contact telephone:	(703) 557-9300
Type of model:	Noise (Cost Benefit)

Abstract:

Determines the minimum cost mix of regulations to achieve level of reduction in noise or gives a cost limit to achieve the maximum reduction of noise.

Functional Capabilities: The Strategy Model prioritizes the cost effectiveness of a given number of products being considered for noise regulations.

Principal users:	EPA
Current implementation:	Minicomputer, mainframe computer
Current hardware:	IBM 370
Software language(s):	FORTRAN
Word size(s):	32 Bit

Input requirements :

Costs of regulation of different types of machines at various noise levels and the benefits of regulation are the inputs to this model.

Output format:

Listing of different regulations to achieve a certain fixed level of noise reduction are the outputs of the model.

(7)

Model name: Workplace Noise Evaluation Model
Sponsor: EPA
Developer: Roger Heymann
Contact: Roger Heymann
Contact address: US EPA, Office of Noise Abatement and Control
Crystal Mall #2, 1921 Jefferson Davis Highway,
Arlington, VA 22202
Contact telephone: (703) 557-2621
Availability: Still in development.
Type of model: Noise
Abstract:

Model assesses the occupational noise impact in industrial factory spaces. Model determines the daily noise dose of exposure for each class of production workers and determines the contribution of each machine to this dose. It will identify the benefits to be gained in terms of reduced exposure from reducing noise levels of one or more machines.

FUNCTIONAL CAPABILITIES:
A weighted sound level and statistical confidence limits are calculated.

Principal users: EPA
Assumptions:

Worker activities can be characterized by a common work assignment schedule.
Noise levels generated by similar equipment is normally distributed.
Primary contributor to noise exposure is the machine being operated by operator in question.
Secondary sources are grouped into the background level with appropriate weighting factors.

Current implementation: Minicomputer; mainframe computer
Current hardware: IBM 360
Software language(s): FORTRAN IV
Word size(s): 32-bit
Input requirements: Worker job assignment number of workers; machinery noise levels at operator locations.
Output format:

- OSHA - personnel noise exposure by job description and industry
- Distribution of noise exposure by job description; i.e., mean and worst case
- Rank ordering of noisy machines by contribution to noise exposure
- Calculation of minimum noise reduction requirements to meet OSHA
- Same for EPA except impact applies rather than exposure.

Analytical Feature for Model: Noise

SECTION VIII
WASTE DISPOSAL MODELS

1. ABTRES
2. IRS
3. WRAP

(1)

Model acronym:	ABTRES
Model name:	Abatement and Residual Forecasting Model
Sponsor:	EPA
Developer:	EPA
Contact:	James Titus
Contact address:	EPA-OPM-Office of Planning and Evaluation, Rm. 220, 401 M St., S.W., Washington, DC, 20460
Contact telephone:	(202) 287-0725
Type of model:	Waste Disposal (Cost Benefit)
Summary:	ABTRES can be used to forecast and report the costs associated with pollution control systems and the concomitant residual levels.

Abstract:

The Abatement and Residual Forecasting Model (ABTRES) forecasts and reports the costs associated with pollution control systems, and the concomitant residual levels. The system is based upon "sectors," that is, processes or technologies which have identifiable pollution control costs. These sectors are aggregated to "chapters" for reporting purposes. Chapters are industrial segments, organized in a manner determined by the analyst. This aggregation is useful since there are often several sequential operations within an industry, each with separate pollution control systems. An industry may be defined in a general manner, to include several different end products, such as "Organic Chemicals."

The ABTRES model allows the user to compute costs associated with meeting the pollution control standards in effect through internal calculations based upon certain input parameters; or the user may enter these costs exogenous In conjunction with these cost forecasts, the model projects estimated residual levels associated with the treatment methods of each abatement technology sector. There are two standards which apply to existing industries to meet Federal guidelines for water pollution control, and these are the Best Practicable Technology (BPT) and the Best Available Technology (BAT). There are separate standards promulgated for plants established after a particular date (which varies by industry), and the set of records is referred to as New Source Performance Standards (NSPS). Sectors dealing with air pollution have a single standard to implement, which is based upon state implementation plans (SIP). There are also more stringent regulations dealing with new plants. Types of pollution considered by the model include: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, carbon monoxides, vinyl chloride, other gases and mists, biological oxygen demand, chemical oxygen demand, suspended solids, dissolved solids, acids, bases, oils and greases.

Document citations:

Wing, B.J., Abatement and Residual Forecasting Model (ABTRES), prepared by the Professional Services Div., Control Data Corporation, Rockville, MD, for the Office of Planning and Evaluation, U.S. Environmental Protection Agency, Washington, DC, April 1977.

Principal users: It has been applied to manufacturing plants and the levels of water pollution associated with these plants.

Assumptions:

ABTRES is an accounting model that subcategorizes industries and computes costs associated with meeting the pollution control standards in effect through internal calculations based upon certain input parameters. Costs may also be entered exogenously. A straight line interpolation method is used to find the growth rates for years not specified as corresponding to these rates. Growth is held constant for the intervals between interpolation years. The conceptual growth curves are smooth; for computational purposes, the step curve is used, allocating all growth to the beginning of the fiscal year.

Current implementation: Mainframe computer
Current hardware: IBM 370
Software language(s): FORTRAN
Word size(s): 32-bit
Input requirements:

Input to the model is in card image form, and the following types of information are included: abatement technology description, number of residuals, equipment life, interest rates, exogenous costs, loading factors, capacity utilization, number of plants, average capacity, growth percentage by interpolation year, percentage of capacity pretreating wastes prior to municipal treatment by interpolation year, residual codes for pollution types, base residual coefficients (to yield total pollutant level generated without any treatment), and fraction of waste treated.

Output format:

Once forecasts of costs and residuals have been generated by the computational program of ABTRES, a report generator is implemented using the output files. The costs for several abatement technology sectors are aggregated as a "chapter level." Different reports are issued for air and water treatment systems.

User manual: Yes
System documentation: Yes

(2)

Model acronym:	IRS
Model name:	Installation Restoration Simulation and Cost Benefit Analysis
Sponsor:	U.S. Army Toxic and Hazardous Materials Agency
Developer:	Arthur D. Little, Inc.
Contact address:	U.S. Army Toxic and Hazardous Materials Agency Aberdeen Proving Ground, MD 21010 Arthur D. Little, Inc.,Cambridge, MA 02140
Contact telephone:	(617) 864-5770
Type of model:	Waste disposal

Abstract:

The Installation Restoration Simulation and Cost/Benefit Analysis has been implemented as a system of computer software designed to be executed by the U.S. Army Toxic and Hazardous Materials Agency (THAMA). The software is divided into five major modules.

Module 1,the Water Transport Module,serves to predict the transport of contaminants through and across Army installations through use of calibrated ground water and surface water computer modules.

Module 2,the Ecology Module,determines the ecological impacts of contaminant migration and predicts where contaminant concentrations might be found in various plant and animal species.

Module 3,the Containment Module,allows the user to devise contaminant physical control measures (e.g., slurry wall, pump wells, surface caps, etc.) and to automatically determine their effects upon contaminant transport. Module 3 also produces detailed cost estimates for the containment alternatives.

Module 4,the Decontamination Module, designseffective treatment plants to treat influent contaminant stream as required using basic treatability data. Module 4 also includes detailed cost estimates.

Module 5,the Cost/Benefit/Risk Module,allows the user to display the results of previous module calculations and also to produce an estimate of the risks associated with his contaminant concentration predictions.

Document Citations:

Arthur D. Little, Inc., Installation Restoration Simulation and Cost/Benefit Analysis: Final Report, prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD, April 1981.

Arthur D. Little, Inc., Installation Restoration Simulation and Cost/Benefit Analysis: Program Documentation (4v.), Prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD, Jan. 1981.

Principal users:	U.S. Army
Current implementation:	Mainframe computer
Current hardware:	UNIVAC 1108
Software language(s):	FORTRAN

Output format:	Tables and plots
User manual:	Yes
Systems documentation:	Yes
Date of latest documents:	1981
Machine interface:	Batch
Learning difficulty:	High
Output interpretation difficulty:	High

(3)

Model acronym:	**WRAP**
Model name:	Waste Resources Allocation Program
Sponsor:	EPA
Developer:	Mitre Corporation, Bedford, MA
Contact address:	The System Management Division Office of Solid Management Waste Programs US EPA 401 M Street, SW Washington, DC, 20460
Contact telephone:	(202)755-9125
Type of model:	Waste Disposal

Abstract:

WRAP is a Waste Resources Allocation Program which has been programmed in FORTRAN. WRAP consists of a series of equations which considers the sources of solid waste generation, a set of sites and processes to be considered at those sites, as well as various site and process capacity constraints. WRAP sorts out the various allocation options specified by a user and indicates a preferred allocation solution which is the minimum cost plan that meets all the user-supplied constraints.

WRAP is an optimizing modeling program which selects, sizes and locates solid waste processing and disposal facilities. Costs for the model planning period are determined by a specialized fixed charge linear programming algorithm.

There are two operational modes available: static and dynamic. The static model allows for only one planning period. The dynamic operating model allows for two to four planning periods. Planning periods are expressed in years, and, in the dynamic mode, are consecutive over the total planning period.

Document citations:

Hensey, Bernice, WRAP: A Model for Regional Solid Waste Management Planning-Progammer's Manual, EPA, Office of Solid Waste, EPA/530/SW-573.

User's guide and systems documentation both available from EPA contact.

Walker, W., Adjacent Extreme Point Algorithms for the Fixed Charge Problem, Technical Report No. 40, Ithaca, NY, Cornell University, College of Engineering, Department of Operations Research, p. 23, Jan. 1968.

Berman, E.B., A Model for Selecting, Sizing, and Locating Regional Solid Waste Processing and Disposal Facilities, M73-111, Bedford, MA, The MITRE Corporation, p. 39, Nov. 1974.

Walker, W.E., A Heuristic Adjacent Extreme Point Algorithm for the Fixed Charge Problems, P-5042, New York, The Rand Institute, p. 21, June 1973.

FCSS; The Fixed Charge Solution System: User Manual, Compuvisor Inc., p. 21, March 15, 1970.

Berman, E.B. (MITRE Corporation), WRAP, A Model for Regional Solid Waste Management Planning: User's Guide, Washington, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1976. (In preparation.)

Berman, E.B., WRAP, A Model for Regional Solid Waste Management Planning: Documentation of Operational and Exercise Runs, MITRE Technical Report MTR-3219 Bedford, Mass., The MITRE Corporation, 1976. (In preparation.)

Principal users:	EPA
Current implementation:	Mainframe computer
Feasible implementation:	Minicomputer
Current hardware:	IBM 370/158
Software language(s):	FORTRAN IV
Word size(s):	32 bit
Lines of source code:	7200
Number of subroutines:	99

Input requirements:

The principal input data for WRAP are solid waste transportation network activities. These activities indicate the origin of the waste, the processing facility (if any) to handle the waste and the disposal destination (defined as a geographic location). Other data associated with a transportation activity are the origin's waste tonnage per year, the haul cost of the waste tonnage from the origin or the processing facility and the travel distance or time between an origin and a destination.

Other input data include facility-related costs and revenues, identification codes and geographic coordinates of the origins and destinations, truck constraints imposed on a destination and limitations of waste processing facilities at a particular location. Descriptions of the eight types of input are given in Figure 1.

Output format:	Cards and printed tables
Source program storage:	264K
User manual:	Yes
Systems documentation:	Yes
Date of latest documents:	1977
Machine interface:	Batch

SECTION IX
CHEMICAL SPILL MODELS

1. CHRIS
2. HACS
3. SAM

Model acronym:	CHRIS
Model name:	Chemical Hazard Response Information System
Sponsor:	U.S. Coast Guard
Developer:	U.S. Coast Guard and Arthur D. Little, Inc.
Contact:	Chief Office of Marine Environment and Systems
Contact address:	U.S. Coast Guard 400 Seventh Street SW, Washington, DC 20590
Contact telephone:	(202) 426-9568
Availability:	Public, Purchase: Depends on Government Printing Office Changes.
Type of model:	Chemical Spills

Abstract:

CHRIS provides information on toxic chemicals and means of analyzing the water transport of chemicals in spill emergencies. The system consists of four manuals, a regional contingency plan, a hazard assessment computer system (HACS) and an organizational entity located at Coast Guard headquarters. The four manuals include (1) A Condensed Guide to Chemical Hazards, (2) Hazardous Chemical Data, (3) Hazard Assessment Handbook, and (4) Response Methods Handbook.

Document citations:

Allan, D.S., et al., Development of Chemical Hazards Response Information Systems (CHRIS), Arthur D. Little, Inc., Report to U.S. Coast Guard, NTIS AD A034655, Office of Research and Development, Washington, DC, October 1976.
A Condensed Guide to Chemical Hazards, CG-446-1, U.S. Coast Guard, U.S.G.P.O. No. 050-012-00106-5, Washington, DC, January 1974.
Hazardous Chemical Data, CG-446-3, U.S. Coast Guard, January 1974, U.S.G.P.O. No. 050-012-0094-8, Washington, DC.
Hazard Assessment Handbook, CG-446-3, U.S. Coast Guard, January 1974.
Response Methods Handbook, CG-446-4, U.S. Coast Guard, January 1975, U.S.G.P.O. No. 050-012-00104-9, Washington, DC.
Raj, P.K., and Kalelkar, A.S., Assessment Models in Support of the Hazard Assessment Handbook (CG-446-3), NTIS no. AD7766176, U.S. Coast Guard, Washington, DC, January 1974.
Raj, P.K., and O'Farrel, P.M., Development of Additional Hazard Assessment Models, Final Report to U.S. Coast Guard, Office of Research and Development, NTIS AD A042365, Arthur D. Little, Inc., March 1975. Chapter 3.

Principal users:	U.S. Coast Guard Personnel
Assumptions:	
Physical Model limitation:	Generally required for version applications
Current implementation:	Handbook, Mainframe computer
Feasible implementation:	Minicomputer

Input requirements:

Tabular manual review of CHRIS graphs and monographs.

Input databases:	Published with handbook series.
Data update frequencies:	As requested and needed.
User manual:	Yes
Date of first version:	1974
Date of latest version:	1979
Date of latest documents:	1979
Learning difficulty:	Medium
User support:	Yes
Continued enhancement:	Yes
Statutory authority:	Water Quality Improvement Act of 1970 Federal Water Pollution Control Act, 1972
Geographic area:	No limited-general

Analytical Features

of Model:	Chemical
Land spill:	No
Water spill:	Yes
Flammable Material spill:	Yes
Oil spill:	Yes
Toxic chemical spill:	Yes

(2)

Model acronym:	**HACS**
Model name:	Hazard Assessment Computer System
Sponsor:	U.S. Coast Guard
Developer:	U.S. Coast Guard and Arthur D. Little, Inc.
Contact:	U.S. Coast Guard, Dr. Michael Parnarouskis; Lt. Richard Harding
Contact address:	U.S. Coast Guard R&D 2100 Second St. SW, Rm 5410, Washington, DC, 20593
Contact telephone:	(202)426-1058
Availability:	Both Public & Proprietary
Type of model:	Chemical spills

Abstract:

HACS is perhaps best described as the computerized counterpart of the CHRIS Hazardous Chemical Data Manual (CG-446-2) and Hazard Assessment Handbook (CG-446-3). It will enable Coast Guard decision makers to quickly obtain more detailed hazard evaluations than may be possible via CG-446-3. Graphic output displays show the relationships among spill concentration, thermal radiation, location, and time. Furthermore, HACS can be used for emergency discharge advance planning and the development and testing of improved hazard assessment methods.

Of concern is the evaluation of and response to any dangerous condition precipitated by accidents involving discharged chemicals which has, as a potential foreseeable consequence, harm or injury to life and/or property. A chemical discharged (or spilled) on water can create a hazard because of its flammability and/or its toxicity. As the spilled material disperses and/or becomes diluted, the hazard normally decreases and disappears. It is important to know how far and fast the danger of fire or poisoning can spread and at what point the chemical ceases to be hazardous. HACS is built on the mathematical models that were created for CG-446-3 and a number of specialized models developed specifically for computer applications. The design and implementation of HACS have focused on providing rapid and quantitative assessments in response to questions such as the following: When will the air/water concentraton of of a discharged material reach a specified level of toxicity at a given location? When will the air/water concentration return to a specified safe nontoxic level? What is the concentration of discharged material at a specified location and time?

The processes of dispersion, evaporation, combustion, etc., which are associated with the chemicals of concern,are quite complex and depend on many variables,not the least of which is the nature of the chemical. HACS offers a systematic and convenient approach to estimate the type and extent of hazard. The hazard estimate is given in terms of distance and times over which a toxic or flammable concentration of a given chemical may exist in water and in air and the minimum safe distance between the spill site and people or combustible materials, should the chemical ignite and a fire ensue. HACS presently contains all necessary physical and chemical property data to permit hazard assesments to be performed for 900 commonly shipped chemicals.

Document citations:

Hazard Assessment Computer System- Development of a HACS User Interface Module Final Report, 30 September 1980 for USCS. HACS/UIM Users' Operations Manual Vol. I, 30 September 1981 for USCS, HACS/UIM Users Operation Manual; Vol. II & Appendices, 30 September 1981; for USCS.

Principal users:

U.S. Coast Guard, but wider distribution of HACS is presently proposed by CEQ through the Chemical Substance Information Network.

Assumptions:	Physical modeling limits, generalization limits
Current implementation:	Handbook, Mainframe computer
Feasible implementation:	Minicomputer
Current hardware:	USCG; CDC 3300-CDC, CDC Cybernet System
Software language(s):	FORTRAN IV
Word size(s):	60 bit
Operating system(s):	No. 5 (intensive & batch version)
Lines of source code:	16,240
Number of subroutines:	160
Input requirements:	Chemical properties database
Input databases:	Chemical properties database
Data update frequencies:	As needed or to added new capabilities
Output format:	Printer plots, line printer, CALCOMP plots
Output complexity:	High
User manual:	Yes
Systems documentation:	Yes
Date of first version:	1976
Date of latest version:	4/81
Date of latest documents:	9/81
Machine interface:	Interactive and batch
Learning difficulty:	Medium
User support:	Yes
Debugging maintenance:	Yes
Continued enhancement:	Yes
Statutory authority:	Water Quality Improvement Act 1970
Geographic area:	Unlimited

Analytical Feature of Model:	Chemical Spills
Land spill:	No
Water spill:	Yes
Flammable materials spill:	Yes
Oil spill:	Yes
Toxic chemical spill:	Yes

(3)

Model acronym:	**SAM**
Model name:	Spill Assessment Model
Sponsor:	AFESC
Developer:	Arthur D. Little, Inc.
Contact:	Capt. George Schlossnagle
Contact address:	Engineering and Services Laboratory (AFESC) Tyndall AFB, FL 32403
Availability:	Public
Type of model:	Chemical Spill

Abstract:

SAM is a mathematical model for application in assessing the impact of catastrophic spills in waterways. The spill model addresses instantaneous and continuous point source discharges into water courses including rivers, lakes, streams and estuaries. The model is in a generalized form using parameters and interchangeable data items so as not to unnecessarily restrict the scope of application to hydrazine. SAM estimates the extent and duration of hazardous concentrations in bodies of water associated with accidental discharges and determines when these concentrations drop below toxic levels. SAM is designed as a management tool to support clean-up operations in the event of a spill, to permit postincident analyses and to serve as a basis for contingency planning.

SAM is based on previous development for the U.S. Coast Guard in the design, development and implementation of the Hazard Assessment Computer System (HACS).

Document citation:

Potts, R.G., et al., Advanced Spill Model, Arthur D. Little, Inc., Report ESL-TR-80-07 to U.S. Air Force, Headquarters Air Force Engineering and Services Center, Tyndall AFB, FL, February 1980, Unclassified.

CHRIS Hazardous Chemical Data, Report No. 050-012-00147-2, U.S. Government Printing Office, Washington, DC, October 1978.

A Condensed Guide to Chemical Hazards, CG-446-1, Report No. 050-012-001406-4, U.S. Government Printing Office, Washington, DC, January 1974.

Hazard Assessment Handbook, CG-446-3, U. S. Coast Guard, Washington, DC, January 1974.

Response Methods Handbook, CG-446-4, Report No. 050-012-0-0104-9, U.S. Government Printing Office, Washington, DC, January 1975.

Hagopian, J.H., and Potts, R.G., HACS User Reference Manual, Arthur D. Little, Inc., Cambridge, MA, February 1977.

Raj, P.K., and Kalelkar, A.S Assessment Models in Support of the Hazard Assessment Handbook (CG-446-3), NTIS AD-776617, U.S. Coast Guard, Washington, DC, January 1974.

Raj, P.K., and O'Farrel, P.M., Development of Additional Hazard Assessment Models, NTIS-AD-A042365, U.S. Coast Guard, Washington, DC, March 1975.

Potts, R.G., HACS Program Reference Manual, Arthur D. Little, Inc., Cambridge, MA, April 1977.

Principal users: AFESC

Assumptions:

Initial temperature of the spilled chemical and the receiving water body are nearly equal. The spill occurs onto the waterway surface (buoyancy effects are not incorporated).

Chemical degradation is modeled as first-order rate constant process. No vapor is liberated from the spilled chemical. The entire mass of the spilled chemical is dispersed. The chemical is fully soluble in water. The receiving water body is considered to be nonisotropic (with different but constant dispersion coefficients along each axis).

Models apply to spills of large quantities that occur under instantaneous or continuous discharge conditions.

River channels have constant rectangular cross sections.

Current implementation:	Handbook, Mainframe Computer
Feasible implementation:	Minicomputer
Current hardware:	CDC-6600
Software language(s):	FORTRAN IV
Word size(s):	60 bits
Operating system(s):	NOS
Lines of source code:	17,000
Number of subroutines:	160

Input requirements:

Chemical, discharge conditions, environmental conditions, marine conditions.

Input databases:

Chemical database is part of the system (contains 900 chemicals).

Output format:	Reports, plotted display and tables.
Output complexity:	Low
Load module storage:	68K words
User manual:	Yes
Systems documentation:	Yes

Date of first version:	5/80
Date of latest version:	5/80
Date of latest documents:	5/80
Machine interface:	Interactive
Learning difficulty:	Medium
User support:	No
Debugging maintenance:	No
Confidentiality:	Public
Geographic area:	Not tied to any specific location - general
Analytical Feature of Model:	Chemical spills
Land spills:	No
Water spills:	Yes
Flammable Material Spills:	Yes
Oil spills:	No
Toxic Chemical Spills:	Yes

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SECTION X
TRAFFIC MODELS

1. BATS
2. HYCAP

Model acronym:	BATS
Model name:	Base Automotive Transportation Simulation
Sponsor:	US Air Force
Developer:	SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025
Contact:	Lt. Harold A. Scott
Contact address:	Engineering and Services Lab., Air Force Engineering and Services Center, Tyndall AFB, FL 32403
Availability:	Public
Type of model:	Traffic

Abstract:

The Base Automotive Transportation Simulation (BATS) Model is a transportation planning and traffic flow model designed to simulate traffic volumes and flows on an airbase. The principal model inputs are a road network, land use zone, demographic variables and gate counts. The land use zones and demographic variables are used to assign volumes to the road network, and these volumes are calibrated using the gate counts. The flow characteristics on each road in the network are simulated using the volumes assigned. Average speed and volumes are the results of the model and these may be directly input to the Air Quality Assessment Model (AQAM) to estimate pollutant emissions and dispersion from traffic sources. A volume flow plot of the network is an optional output of the model.

Document citations:

SIR Inernational, User Guide for the Air Force Base Automotive Transportation Simulation Model-BATS V.1: Data Collection and Reduction; V.2: Documentation; V.3: Documentation Appendices D and E, ESL-TR-79-16, Air Force Engineering and Services Center, Engineering and Services Laboratory, Tyndall AFB, FL, September 1979.

Principal users:	US Air Force
Validations:	Medium
Current implementation:	Mainframe
Feasible implementation:	Minicomputer
Current hardware:	CDC 6400/6600
Software language(s):	FORTRAN IV
Word size(s):	60 bit
Operating system(s):	KRONOS, SCOPE
Lines of subroutines:	39

Input requirements:

The principal model inputs are a road network, land use zones, demographic variables and gate counts.

Input databases:

Data is available for three different Air Force bases (provides default data).

Output format:

Average speed and volumes are the results of the model and these may be directly input to the Air Quality Assessment Model (AQAM) to estimate pollutant emissions and dispersion from traffic sources. A volume flow plot of the network is an optional output of the model, also computer printer and graphic display.

Output complexity:	Low
Source program storage:	60,000 words
User manual:	Yes
Systems documentation:	Yes
Date of latest version:	1979
Date of latest documents:	1979
Machine interface:	Batch
Learning difficulty:	Medium
User support:	Yes
Debugging maintenance:	No
Statutory authority:	Clean Air Act

(2)

Model acronym:	**HYCAP**
Model name:	Highway Capacity Analysis
Developer:	Mackin Engineering Co., Antonette C. Sotirake
Contact:	Society for Computer Applications in Engineering Planning and Architecture, Inc.
Contact address:	358 Hungerford Drive Rockville, MD 20850
Contact telephone:	(301)762-6070
Type of model:	Traffic

Abstract:

SCOPE: This program performs the capacity analysis of freeways, undivided multilane rural highways and two-lane highways based upon the 1965 Highway Capacity Manual. The program will calculate one of the following unknowns: service volume, number of lanes or level of service.

Current implementation:	Minicomputer
Feasible implementation:	Mainframe computer
Current hardware:	IBM 1130
Software Language(s):	FORTRAN
Word size(s):	16 bit
Operating system(s):	1442 card reader, 1132 printer
Lines of source code:	1380

Input requirements:

Service volume, number of lanes, level of service, peak hour factor, land width, obstruction distances - Left & Right, percent of grade, length of grade, percent trucks, average highway speed, passing sight distance and type of facility. Either the service volume, number of lanes or level of service must be left "Blank."

Output format:

1. An echo of the input data
2. Modification statement (only printed if program adjusts the input data)
3. Description of the unknown (service volume, number of lanes, or level of service)
4. The results. In some cases one value is printed, while in others a series of values is printed in which the user may make his own determination of the results.

Source program storage:	8K
User manual:	Yes
Date of first version:	1972
Date of latest version:	1972
Date of latest documents:	1972
User support:	No

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SECTION XI

DATABASES

1. INTRODUCTION

Environmental data is a key component of any modeling activity and is central to an operational modeling library. Data which are readily available to conduct modeling studies can be used to analyze alternate plans or scenarios which enables rapid and assured results.

The database descriptions included in this appendix are in draft form. A detailed review of the individual database storage requirements, access software and stored variables must be undertaken when the Air Force chooses to implement an environmental modeling library. A comparison of the data available from the machine readable databases can be made with the input data requirements of the individual environmental models. In this way a clear delineation of data availability and model data needs can be made.

All recommended databases are machine readable and have their own or special purpose systems. The databases contain routinely monitored variables (e.g. air or water quality, etc.) or installed data from special purpose studies. In many cases databases undoubtedly contain overlapping data variables, although the temporal and spatial resolution may not be concurrent.

In general, very few databases were designed to support modeling activities. Normally the spatial or temporal resolution of a variable does not match the input data resolution of a given model. Data can be processed statistically in many cases to satisfy the model's requirements.

An ideal modeling database would eventually be covered by an umbrella access system so that knowledge of only one management system would be necessary. This would undoubtedly be a large undertaking, but nevertheless quite important.

In several cases, the data required by a specific model are compiled and available with that model. Data required for atmospheric transport models are in many cases available from the National Climatic Center in Asheville, North Carolina. Flow data, land use and cover data, and other hydrologic data are available from the United States Geological Survey.

The EPA has compiled a catalog of environmental databases in Environmental Databases and Model Index Draft Directory. Reading this with Air Force modeling needs generally in mind produced the list of databases shown in Table II-3. Criteria for selection were data in areas of modeling needs. Machine readable data were of particular interest, as were toxic chemical and groundwater data.

TABLE H-3. DATABASES OF POTENTIAL INTEREST TO AIR FORCE MODELING

GENERAL ENVIRONMENTAL DATABASES AND DATA SYSTEMS

FFIS	Federal Facilities Information System, EPA Ref: 3103000902
SEAS-RES	Strategic Environmental Assessment System, Nonpollutant Database, EPA Ref: D6301000110
GEDS	Gaseous Emissions Data System, (Part of EADS) EPA Ref: D6302000111
MEGDAT	Multimedia Environmental Goals Database (Part of EADS) EPA Ref: D6302000112
LEDS	Liquid Effluents Data System (Parts of EADS Environmental Assessment Data System) EPA Ref: D6302000108
FPEIS	Fine Particle Emissions Information System (Part of EADS) EPA Ref: 6302000109
SDDS	Solid Discharge Data System (Part of EADS) EPA Ref: 6302000110
FEIS	Fugitive Emissions Information System (Part of EADS) EPA Ref: D6302000113
SWEMS	Soil, Water, Estuarine Monitoring System, EPA Ref: D7301400901
--	Priority Pollutants, EPA Ref: D9038000906A
--	Ambient Priority Pollutant Program, EPA Ref: D9038000906B
--	Priority Pollutants Effluent Guidelines, EPA Ref: D9038000906C
LUDA	USGS Digital Land Use and Land Cover Data
APIS	USGS Aerial Photography Information System
APSRS File	USGS Aerial Photography Summary Record System File
DCDI/DMA-DEM	USGS Digital Cartographic Database/Defense Mapping Agency - Digital Elevation Models
DCDI-GPM	USGS Digital Cartographic Database/Gestalt Photo Mapper II - Digital Elevation Models
DCDI/NCIC-DEM	USGS Digital Cartographic Database/National Cartographic Information Center - Digital Elevation Models
MCIS FILE	USGS Map and Chart Information System File

AIR DATABASES AND DATA SYSTEMS

CMS	Continuous Monitoring Subset, Point Sources Air Emissions as Required Under State Implementation Plans, EPA Ref: D3403000902
NAMS/MIS	National Air Monitoring Stations Management Information Systems, EPA Ref: D450400923
ADMIS	Aerosol Data Management Information System, EPA Ref: D6402000102
CTM	Complex Terrain Database (Air Database), EPA Ref: D6402000119
FMF	Fluid Modeling Facility (Air Dispersion), EPA Ref: D6402000136
HIS & PAR	National Weather Service Data, EPA Ref: 6402000166
WHO-WMO	International Air Database, EPA Ref: D6202000103
IPBANK	Inhalable Particulate Analysis Bank, EPA Ref: D6202000106
FBANK3	National Air Monitoring System, EPA Ref: D6202000109
NFOS	National Background Monitoring Study (Background Ozone) Database, EPA Ref: D620200110
SAD	Acid Rain Database, EPA Ref: D620200115
BACTLAER	Major Source Air Emissions Database, EPA Ref: D4502000905
AQDHS	Air Qual. Data Handling System, EPA Ref:D4504000917
SAROAD	Storage and Retrieval of Aeroetric Data, EPA Ref: D 4504000918
SOTDAT	Source Test Data System, Point Source Stack Emission Database and System, EPA Ref: D4504000919
NEDS	National Emissions Database, EPA Ref: D4504000921
EIS/P & R	Emission Inventory Subsystem/Permits and Registration, EPA Ref: D450400922
DATSAU	USAF ETAC Air Databases

WATER DATABASES AND DATA SYSTEMS

PCS	Permit Compliance System Effluent Data from NPDES Permitted Facilities, EPA Ref: D3302000101
--	Basic Water Monitoring Core Stations, EPA Ref: D5303000102
HISLIB	Effluent Guidelines Gase Chromatograph/Mass Spectometric Screening Analysis Database, EPA Ref: D6404000109
WDROP	Distribution Register of Organic Pollutants in Water, EPA Ref: D6404000110
LAMS	Lake Analysis Management System, EPA Ref: D6407000103
WATSTORE	USGS Water Data System Accesses ADR- Automatic Digital Recorder Tapes BIOFILE- Biological Analysis of Water Samples ORGFILE- Biological Organism Name File DV FILE- Daily Values File WRD DCPMIF- Data Collection Platform Management Information File DEFINITIONS- Definitions Database GEO-UNITS-Geologic Unit File WRD-GOES- GOES Data Collection System File GWSI- Ground Water Site Inventory WRD-LANDSAT- LANDSAT Data Collection System File MDCPSF-MULTICS Data Collection Platform Sys. File NWUDS- National Water Use Data System PKFIL- Peak Flow File RAT FILE- Rating Table File WRD.STAHDR- Station Header File SBC FILE- Streamflow Basin Characteristics File TT FILE- Time of Travel File WRD.UNIT- Unit Values File QW FILE- Water Quality Data File WRAFT- WATSTORE Real Time Front End Hydrologic Data Processing System WRD COUNTY -WRD County Code File
--	Basic Water Monitoring Core Station, EPA Ref: D5303000102
NWQSS	National Water Quality Surveillance System, EPA Ref: D5303000103
IFD File	Industrial Facilities Discharge File, EPA Ref: D5303000105
SIAIS	Surface Impoundment Assessment Information System, EPA Ref: D5502000905
NPDES DMR	National Pollutant Discharge Elimination System Discharge Monitoring Reports, EPA Ref: D9015000901
NPDES	National Pollutant Discharge Elimination System Permit Compliance, EPA Ref: D9038000902A Permit Compliance Monitoring, EPA Ref: D9038000902B
NRUP	Nationwide Urban Runoff Program, EPA Ref: D5206000901

STORET	Storage and Retrieval System Water Quality Information System, EPA Ref: D5303000101
--	IFB Organics Database, EPA Ref: D5302000103
NSWMP	National Surface Water Monitoring Program, EPA Ref: D7301400905
QW PARAMETERS	USGS Water Quality Parameter File NAWDEX
HEADING FILE	USGS Generalized Retrieval System Heading File NAWDEX
MWDI Data Dictionary	USGS Master Water Data Index NAWDEX
WDSD Data Dictionary	USGS Water Data Sources Dictionary NAWDEX
LAC Directory	USGS Local Assistance Centers of NAWDEX
--	The Reach File EPA
DADIO	USGS Direct Access Data Input/Output File of Spatial Time - Series Data for Numerical Simulation Modeling
FMI	USGS Flood Map Inventory
FLSTBASE	USGS Full-State Digitized Hydrologic Unit Lines Database
HUNDBASE	USGS Hydrologic Unit Name and Description Database
WPI	USGS WRD/MIS Projects Information System

ECOLOGICAL DATABASES AND DATA SYSTEMS

--	Biological Storage and Retrieval Master Species List, EPA Ref: D6203000101
BIOSTORET	Biological Data Management System, EPA Ref: D6203000103
--	Fish Kill Database, EPA Ref: D5303000106

GEOLOGY AND SOIL DATABASES AND DATA SYSTEMS

QUAKES	USGS Earthquake Data Retrieval Database
GEOINDEX	USGS Index to Geologic Maps
RASS	USGS Rock Analysis Storage System
DESAS	USGS Seismic Data Analysis System

CHEMICAL DATABASES AND DATA SYSTEMS

CIS	NIH/EPA Chemical Information System, EPA Ref: D2209000905
OCPDB	Organic Chemical Producers Database, EPA Ref: D6303000106
--	Inorganic Chemicals Industry Regulation Record, EPA Ref: D5302000111
CSIN	Chemical Substances Information Network, EPA Ref: D710300091
PDMS	Pesticide Document Management System, EPA Ref: D7202000005
PPIS	Pesticide Product Information System, EPA Ref: 7202000009
CRGS	Chemical Regulations and Guidelines, EPA Ref: D7301700903
CICIS	Chemicals in Commerce Information System, EPA Ref: D7301700904

SOCIOECONOMIC GENERAL DATABASES AND DATA SYSTEMS

CELDS	Computer-Aided Environmental Legislative Data System (Part of ETIS)

NOISE DATABASES AND DATA SYSTEMS

--	Truck Noise Databases, EPA Ref; D3203000001
--	Portable Air Compressor Noise Database, EPA Ref: D3203000002
--	State and Local Noise Control Databases, EPA Ref: D4404000905

RADIATION DATABASES AND DATA SYSTEMS

STDMS	Fission Products Database Departments of Energy and Defense Facilities, Radiochemical Analyses Technical Support to State Regulatory Agencies EPA Ref: D420500905
STDMS	Sample Tracking and Data management system (Environmental Radiation), EPA Ref: D6204000118
ERFDAYYY	RANDAY Gross Beta Concentration Database, EPA Ref: D4206000904
--	Environmental Radiofrequency Database, EPA Ref: D4207000901

EXPOSURE AND EPIDEMIOLOGY AND DATA SYSTEMS

CLEANS/CLEVER	Clinical Laboratory for Evaluation and Analysis of Noxious Substances/Clinical Laboratory for Evaluation of Epidemiological Research, EPA Ref: 6502000105

WASTE MANAGEMENT DATABASES AND DATA SYSTEMS

STS	Hazardous Waste Site Tracking System, EPA Ref: D3103000903
WTPIS	Wastewater Treatment Processes Information System, EPA Ref: D6304000921
HWDMS	Hazardous Waste Data Management System, EPA Ref: D5601100901
--	Waste Characterization Database, EPA Ref: D5602000001
--	Incinerator Trial Born Database, EPA Ref: D5602000102

CHEMICAL SPILL

SPCC	Spill Prevention Control and Countermeasure Database, EPA Ref: D5204000101
OHM-TADS	Oil and Hazardous Materials - Technical Assistance Data System, EPA Ref: D5204000102
NEEDS	NEEDS Survey Municipal Wastewater Treatment Facilities, EPA Ref: D520500901

3. SECOND MODEL DATABASE SELECTION

The model selection process described in Appendix E then took place and the air and water databases from the preliminary selection were studied as possible input data sources for the air and water models selected as most suitable for Air Force modeling needs.

a. Air Databases

The following air databases are useful for Air Force modeling.

TABLE H-4. AIR MODEL DATABASES

-- BACT LEAR	EPA	Ref:	D4502000905
-- SAROAD	EPA	Ref:	D4504000918
-- SOTDAT	EPA	Ref:	D4504000921
RAPS	EPA	Ref:	D6402000120

The following data can be obtained from the National Climatic Center in Asheville, NC, for use with selected models. STAR tabulations are joint frequencies of wind direction, wind speed and stability compiled on a monthly, seasonal or annual basis that are applicable as inputs for CDMQC, TCM2, VALLEY, ISCLT, ATM and HEP. Hourly surface data normally on magnetic tape in card image format, CARD DECK 144, are used as input after processing in RAM, CRSTER, MPTER, APRAC and ISCST. NAMER-WINDTEMP data tapes contain radiosonde observations for North America that are appropriate input to the ARL-ATAD trajectory model.

b. Water Model Databases

The databases which may be useful in applications of water-related models are described in Table 2. This is a general description for the applicable models; no specific model names are indicated. The databases or data systems could be input parameters to the applicable models or useful information for model development, calibration and verification.

TABLE H-5. WATER MODEL DATABASES

Basic water monitoring core stations	Surface water quality models
WDROP	Toxic chemical exposure models
LAMS	Surface water quality models & ecology models (for lakes)

WATSTORE	Water quantity and water quality models for surface water and groundwater
NWQSS	Surface water quality models and toxic chemical exposure models
IFD	Surface water quality models and toxic chemical exposure models
SIAIS	Ground water models
NPDES DMR	Surface water quality models and toxic chemical exposure models
NPDES	Surface water quality models and toxic chemical exposure models
NRUP	Surface water models (especially for non-point source models)
STORET	Surface water & groundwater models, toxic chemical exposure models and ecology models
IFB Organics Database	Toxic chemical exposure models
NSWMP	Toxic chemical exposure models (for streams)
The Reach File EPA	Surface water models
DADIO	Surface water quantity models

4. ALPHABETICAL LISTING OF SELECTED WATER DATABASES

a. Index of Selected Water Databases

Basic Water Monitoring Core Stations
IFD
LAMS
National Surface Water Monitoring Program
NPDES
NQSS
NURP
NWQSS
SIAIS
STORET
WDROP

(1) Basic Water Monitoring Core Stations

Acronym: None
Media sampled to generate data: Sediment
Surface water fresh
Tissue indigenous species: fish/shellfish
Type of data collection/monitoring: Ambient data collection
Database status: Operational/ongoing

ABSTRACT: Data are collected from the national ambient water quality monitoring network of 1,000 stations, comprised primarily of minimum "core" network of State stations selected as a subset of ongoing State programs. Stations are operated monthly, with a common list of parameter codes, and the data are used for national trend assessments.

Nonpollutant parameters include: Biological data
Collection method
Flow rates
Geographic subdivision
Salinity
Sampling date
Site description
Temperature
Conductivity
Transparency

Ongoing study time period is 10/01/78 to 09/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: monthly

Total estimated number of observations is 24000.
Estimated annual increase of observations is 12000.

Database includes: Raw data/observations

Total number of stations or sources covered is 1000.
Number currently contributing data is 1000.

Geographic coverage of database: National
Location identifiers of station/source for each record are: State
County
City
Town/township
Coordinates Lat. and long.
Proj. identifier
Agency-code
Station-number

Facility identifiers include: Not applicable

Pollutant identification data have: Storet parameter codes

Limitations: Frequency varies by parameter codes

Data collection and analysis procedures: Sampling plan documented
Collection method documented
Analysis method documented
QA procedures documented
Lab analysis based on EPA-approved or accepted methods.
Lab audit is partially satisfactory. It varies by state laboratory.
Precision and accuracy estimates exist but are not included in database
Edit STORET general screening for outliers.

Data collected by: State agency - 50 State Water Pollution Control Agencies
Data Analyzed by: State agency - 50 State Water Pollution Control Agencies
Database does not identify specific laboratory performing analysis.

Trend assessment is the primary purpose for data collection.
Statutory authorization is P L 95-217, Section 104(a)(5) (Clean Water Act-CWA)
Form of available reports and outputs: Publications National Water Quality Inventory/Report to Congress
Unpublished reports December 1 Report to the Administrator
Printouts on request
Microfilm
Machine-readable raw data
On-line computer
Included in Council on Environ. & Quality Report-Environmental Quality
Current regular users of databases: 1200
Users: EPA headquarter offices - Office of Water Regulations and Standards, Office of Pesticides and Toxic Substances, Office of Water Programs Operations.
EPA regional offices
EPA laboratories
Other federal agencies
States
Universities
Confidentiality: No limits on access to data
Primary physical location of data: Headquarters office
Form of data storage: Magnetic disc
Data access: EPA software STORET
Data access: EPA hardware IBM 370/168

Contact - Subject matter: Reg. Basic Water Monitoring Program Coordinator
Contact - Computer-related; Sam Conger (202) 426-7792
Contact - responsible EPA Office: Regional Basic Water Monitoring Program Coordinator
Charge for non-EPA use: no
Frequency of master file update: Weekly

Related EPA databases: National Water Quality Surveillance System

Related non-EPA database: State Systems: U.S. Geological Survey National Stream Quality Network (NASQAN)

Person completing form: Morris L. Mabbitt
Office: EPA/(OWWM)/(OWRS)/(MDSD)
Address: 401 M St., S.W. Washington, DC, 20460
Phone: (202) 426-7778

Pollutants tests included in database
dissolved oxygen
fecal coliform
nitrogen 7727-37-9
oxygen demand
ph
phosphorus 7723-14-0
suspended solids
transparency
specific conductivity
total organic carbon (TOC)
methoxychlor 72-43-5
nitrates/nitrites
hexachlorocyclohexane 58-89-9

(2) Industrial Facilities Discharge File

Acronym: IFD FILE
Media sampled to generate data: Other not related to a specific media: data collected from Permit Compliance System and regional National Pollutant Discharge Elimination System Forms.
Type of data collection/monitoring: Point source data collection industrial dischargers
Database status: Operational/ongoing

ABSTRACT: File consists of major, minor and indirect dischargers (section 4 only) for the 21 major industrial categories. Key data elements collected: National Pollutant Discharge Elimination system number, name, address, receiving stream, lat./long., pipes, flow, process type, basin codes, REACH number, SIC codes, STORET effluent monitoring stations, as they become available. The database covers those industries suspected of discharging the 129 Consent Decree Priority Pollutants, but no pollutant parameter codes are actually included in the data.

Nonpollutant parameters include:
- Discharge points
- Flow rates
- Geographic subdivision
- Industry
- Location
- Manufacturer
- Political subdivisions
- Population demographics

Ongoing study time period is 12/01/78 to 10/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: as needed

Total estimated number of observations is 40000.
Estimated annual increase of observations is 10000.

Database includes: Reference data/citations

Total number of stations or sources covered is 40000.
Number currently contributing data is 10.
Number of facilities covered is 40000.

Geographic coverage of database: National
Location identifiers of station/source for each record are:
- State
- County
- City
- Street address
- Coordinates Lat./Long.
- Stream name

Facility identifiers include: Plant facility name
Plant location
Street address
SIC code
Dun and Bradstreet number
NPDES
Program identifier

Pollutant identification data have: Storet parameter codes
CAS registry number codes

Limitations: File is an EPA in-house database. No training or user assistance is supported by the agency. User cannot update file. Retrievals by project office or users may train themselves.

Data collection and analysis procedures: QA procedures documented
Lab analysis not based on EPA-approved or accepted methods
Lab audit: Data not based on lab analysis
Precision and accuracy estimates exist but are not included in database
Edit procedures used and documented

Data collected by: State agency - 2% of data is from various state agencies
Regional office - 3% of data is from Regional Offices
Contractor - 95% of the data is from SCS Engineers-prime contractor

Data analyzed by: Contractor - SCS Engineers
EPA headquarters - Monitoring and Data Support Division

Database does not identify specific laboratory performing analysis.

Risk assessment is the primary purpose for data collection.
Development of regulations or standards is the secondary purpose for data collection.
No statutory requirement: Compliance with consent decree
OMB form number: 158-R-0096
OMB form number: 158-R-0100
Form of available reports and outputs: Printouts on request
On-line computer
Current regular users of database: three offices
Users: EPA headquarter offices - Office of Enforcement; Office of Drinking Water; Office of Water Regulations and Standards
Confidentiality: No limits on access to data
Primary physical location of data: NCC/IBM
Form of data storage: Magnetic disc
Data access: EPA software In-house System (locally developed)
EPA hardware IBM 370/168

Contact - Subject matter: Robert J. Pease (202) 426-7780
Contact - Computer-related: Tom Pandolfi (202) 426-7760
Contact - Responsible EPA Office: Phil Taylor (202) 426-7760

Charge for non-EPA use: no outside use/access permitted
Frequency of master file update: Weekly

Related EPA databases: STORET (Storage and Retrieval of Water Quality Data), REACH, WATER SUPPLY, GAGE Files, Permit Compliance System.
Related non-EPA databases: Dun & Bradstreet Database (tapes), U.S. Geological Survey Hydrological Cataloging Unit File

Person completing form: Robert J. Pease
Office: EPA/(OWWM)/(OWRS)/(MDSD)
Address: 401 M St., S.W. Washington, DC 20460
Phone: (202) 426-7780

(3) Lake Analysis Management System

Acronym: LAMS
Media sampled to generate data: Atmospheric deposition
Sediment
Surface water lake, river mouth
Tissue fish
Type of data collection/monitoring: Ambient data collection
Database status: Operational/ongoing

ABSTRACT: This database includes all water quality data collected by the EPA, Office of Research and Development research program as administered by the Large Lakes Research Station, Grosse Ile, MI since 1971. Database also includes Canadian Great Lakes data since 1968.

Nonpollutant parameters include: Biological data
Chemical data
Concentration measures
Elevation
Flow rates
Physcial data
Salinity
Sampling date
Site description
Temperature
Turbidity
Transparency
Total alkalinity
Biochemical oxygen demand
Dissolved oxygen
Total residue
Total hardness
Total volatile residue
Total nonfilterable residue
Total carbon
Silica
Chlorophyll A
Zooplankton
Phytoplankton

Ongoing; study time period is 05/01/68 to 10/30/79 (present)
Termination of data collection: Not anticipated

Frequency of data collection: daily
variable-usually 10-12 cruises per year

Total estimated number of observations is 1000000.
Estimated annual increase of observations is 10000.

Database includes: Raw data/observations

Total number of stations or sources covered is 7000.
Number currently contributing data is 100.

Geographic coverage of database: International
Location identifiers of station/source for each record are: State
Coordinates
Lat./long.

Facility identifiers include: Not applicable
Pollutant identifications data have: Storet parameter codes
Coded with other coding schemes

Limitations: Data exists in several places: STORET (Storage and Retrieval of Water Quality Data), Large Lake Research Station-Data Storage and Analysis System, and reports. Data varies according to lake, nearshore area and water quality issue. Much of the data used for development of fate and transport models.
Data collection and analysis procedures: Sampling plan documented
Collection method documented
Lab analysis not based on EPA-approved or accepted methods.
Lab audit is satisfactory for 50%.
Precision and accuracy estimates exist but are not included in database.
Edit part of data stored in STORET.

Data collected by: EPA lab - Large Lakes Research Station, Environmental Research Lab, Duluth, MN
Contractor lab - State University of New York-Buffalo; University of Michigan; Ohio State University; Cranbrook Research Institute
Canadian Center for Great Lakes Research
Data Analyzed by: EPA lab - Large Lakes Research Station, Environmental Research Lab, Duluth, MN
Contractor lab - Manhattan College
Database identifies specific laboratory performing analysis.

Fate and transport research is the primary purpose for data collection.
Trand assessment is the secondary purpose for data collection.
Anticipatory/research is the secondary purpose for data collection.
Statutory authorization is P L 92-500, Sections 104, and 105 (Great Lakes) (Clean Water Act-CWA)
Form of available reports and outputs: Pub. "Mathematical Models of Water Quality," Large Lakes Research Station, National Technical Information Service
Unpublished reports Distribution of Polychlorinated Biphenyls (PCB) in Saginaw Bay
Machine-readable raw data
On-line computer
Through STORET system
Current regular users of database: 10 or more
Users: EPA regional offices
EPA laboratories
Other federal agencies

States
International Joint Commission
Confidentiality: No limts on access to data
Primary physical location of data: NCC/IBM
Form of data storage: Magnetic disc
Data access: EPA software STORET (Storage and Retrieval of Water Quality Data) & Data Storage and Analysis (DASA) MIDSD system number: 6505000103MA, EPA hardware IBM and PDP 11/45

Contact - Subject matter: William L. Richardson (313) 226-7811
Contact - Computer-related: William L. Richardson (313) 226-7811
Contact - responsible EPA Office: Nelson Thomas (313) 226-7811

Charge for non-EPA user: yes
Frequency of master file update: periodic as needed

Related EPA systems: Great Lakes Mathematical Models

Person completing Form: William L. Richardson
Office: EPA/(ORD)/(OEPER)/(ERL-D)/(ILRS)
Address: 9311 Groh Road, Grosse Ile, MI 48138
Phone: (313) 226-7811

Pollutants include in database:
cadmium 7440-43-9
copper 7440-50-8
lead 7439-92-1
chloride
kjeldahl nitrogen
ammonia nitrogen
homologs
nitrates/nitrites
nitrogen 7727-37-9
pcb-1016 (arochlor 1016) 12674-11-2
pcb-1221 (arochlor 1221) 11104-28-2
pcb-1242 (arochlor 1242) 53469-21-9
pcb-1248 (arochlor 1248) 12672-29-6
pcb-1254 (arochlor 1254) 11097-69-1
pcb-1260 (arochlor 1260) 11096-82-5
ph
phosphorus 7723-14-0
polychlorinated biphenyls (PCBs)
zinc 7440-66-6

(4) National Surface Water Monitoring Program

Acronym: NSWMP
Media sampled to generate data: Surface water streams
Type of data collection/monitoring: Ambient data collection
Database status: Operational/ongoing

ABSTRACT: Contains pesticide residue and toxic substance monitoring data on 40 chemicals at approximately 150 nationwide collection stations.

Nonpollutant parameters include:
Collection method
Concentration measures
Flow rates
Geographic subdivision
Location
Physical data
Political subdivisions
Sampling date
Site description
Temperature
Test/analysis method
Use
Volume/mass measures

Ongoing study time period is 05/01/76 to 08/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: quarterly

Total estimated number of observations is 90000.
Estimated annual increase of observations is 600-1000.

Database includes: Raw data/observations

Total number of stations or sources covered is 150.
Number currently contributing data is 150.

Geographic coverage of database: National
Location identifiers of station/source for each record are: State
Coordinates Lat. and long.

Facility identifiers include: Not applicable
Pollutant identification data have:

Data collection and analysis procedures: Sampling plan documented
Collection method documented
Lab analysis not based on EPA-approved or accepted methods.
Lab audit is satisfactory.
Precision and accuracy estimates exist but are not included in database
Edit procedures used but undocumented.

Data collected by: Other federal agency - U.S. Geological Survey
Stream Quality Accounting Network NASQAN) Stations
Data analyzed by: EPA lab - Bay St. Louis, MS, Office of Pesticides and Toxic Substances
EPA headquarters - Field Studies Branch, Office of Pesticides and Toxic Substances
Database identifies specific laboratory performing analysis.

Trend assessment is the primary purpose for data collection
Statutory authorization is P L 92-516 as amended, Section 20 (Federal Insecticide, Fungicide and Rodenticide Act-FIFRA)
Form of available reports and output: On-line computer
Current regular users of database: 80-100
Users: EPA headquarter offices - Office of Pesticides and Toxic Substances
Other federal agencies
States
Confidentiality: No limits on access to data
Primary physical location of data: EPA lab
Form of data storage: Magnetic tape
Data access: EPA software Soil, Water, Estuarine Monitoring System (SWEMS)
MIDSD system number: 75030090
EPA hardware IBM 370/168

Contact - Subject matter: Thomas Dixon (202) 755-8060
Contact - Computer-related: Dennis Herrin (202) 755-8060
Contact - responsible EPA Office: Thomas Dixon (202) 755-8060

Charge for non-EPA use: no
Frequency of master file update: Quarterly

Related EPA databases: National Soils Monitoring Program

Person completing form: Thomas Dixon
Office: EPA/(OPTS)/(EED)/(FSB)/(OTS)
Address: 401 M St., SW, Washington, DC 20460
Phone: (202) 755-8060

Pollutants included in database:
alachlor 15972-60-8
aldrin 309-00-2
isodrin 465-73-6
dimethyl tetrachloroterephthalate(DCPA
tributyl phosphorotrithioite (merphos)
s(p-chlorophenylthio)methyl 0,0-diethy
phosphorordithioate (carbophenothion)
(2,3,6-trichlorophenyl)acetic acid
atrazine 1912-24-9
bhc-alpha 319-84-6
bhc-beta 319-85-7
bhc(lindane)-gamma 58-89-9
chlordane 57-74-9
chlorinated naphthalenes

endosulfan sulfate 1031-07-8
endrin 72-20-8
ethion 563-12-2
heptachlor 76-44-8
heptachlor epoxide 1024-57-3
hexachlorobenzene 113-74-1
malathion 121-75-5

methoxychlor 72-43-5
methyl parathion 298-00-0
parathion 56-38-2
phorate 298-02-2
polybrominated biphenyls (PBBs)
propachlor 1918-16-7
ronnel 299-84-3
silvex 93-72-1
simazine 122-34-9
toxaphene 8001-35-2
ddt
diazinon 333-41-5
dicamba 1918-00-9
dieldrin 60-57-1
endosulfan-alpha 959-98-9
endosulfan-beta 33213-65-9
trifluraline (treflan) 1582-09-8
tributyl phosphorotrithioate 78-48-8
2,4-dichlorophenoxyacetic acid(2,4-d) 94-75-7
2,4,5-trichlorophenol 95-95-4
2,4,5-trichlorophenoxyacetic acid(t) 93-76-5
pentachlorophenol 87-86-5

(5) National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports

Acronym: NPDES DMR
Media sampled to generate data: Effluents municipal and nonmunicipal
Type of data collection/monitoring: Point source data collection effluent
Database status: Operational/ongoing

ABSTRACT: The database consists of the results of the Discharge Monitoring Reports that are required as part of the National Pollutant Discharge Elimination System (NPDES) Permit. The data is manually maintained for the major municipal and nonmunicipal dischargers in Maine, Massachusetts, New Hampshire and Rhode Island.

Nonpollutant parameters include: Compliance data
Discharge points
Temperature

Ongoing study time period is 01/01/75 to 09/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: quarterly
semiannually
annually
as needed
Monthly: most

Total estimated number of observations is 200000.
Estimated annual increase of observations is 60000.

Database includes: Summary or aggregate observations

Total number of stations or sources covered is 432.
Number currently contributing data is 432.
Number of facilities covered is 432.

Geographic coverage of database: Selected federal region:Region I
Geographic region:New England
Location identifiers of station/source for each record are: State
County
City
Town/township
Street address
Proj. identifier

Facility identifiers include: Plant facility name
Plant location
Parent corporation location
Street address
SIC code
NPDES
Program identifier
Pollutant identification data are: Uncoded

Limitations: Parameters and frequency vary by permittee. Numbers of facilities and observations are for major dischargers only; minor dischargers represent a database of approximately equal size.

Data collection and analysis procedures: documented in quality assurance project plan
Lab analysis based on EPA-approved or accepted methods.
Lab audit is satisfactory for 85%.
Precision and accuracy estimates exist but are not included in database
Edit procedures used and documented.

Data collected by: Selfreporting Permittees
Regional office - Region I
Data analyzed by: Selfreporting Permittees
Regional office - Region I
Database does not identify specific laboratory performing analysis.

Compliance or enforcement is the primary purpose for data collection.
Statutory authorization is P L 92-500, Sections 301, 308 and 402 (Clean Water Act-CWA)
Form of available reports and outputs: Unpublished reports Quarterly Non-compliance Report
Current regular users of database: 80-100
Users: EPA headquarter offices - Office of Enforcement
EPA regional offices
EPA laboratories
States
Confidentiality: No limits on access to data
Primary physical location of data: Regional office
Form of data storage: Microfiche/film
Data access: Manually

Contact - Subject matter: Larry Brill (617) 223-5330
Contact - responsible EPA Office: Enforcement Division Region I (617) 223-5330
Charge for non-EPA use: yes
Frequency of master file update: Semiannually

Related EPA databases: Permit Compliance System (PCS)
Related non-EPA databases: Maine-automated Discharge Monitoring Report (DMR) file.
Person completing form: Larry Brill
Office: EPA/Region I/Enforcement Division
Address: JFK Building, Boston, MA 02203
Phone: (617) 223-5330

Pollutant tests included in data base
acenaphthene 83-32-9
acenaphthylene 208-96-8
acrolein 107-02-8
acrylonitrile 107-13-1
aldrin 309-00-2

anthracene 120-12-7
antimony 7440-36-0
arsenic 7440-38-2
asbestos 1332-21-4
benzene 71-43-2
benzidine 92-87-5
benzo(a)anthracene 56-55-3
benzo(a)pyrene 50-32-8
benzo(g,h,i)perylene 191-24-2
benzo(k)fluoranthene 207-08-9
beryllium 7440-41-7
bhc-alpha 319-84-6
bhc-beta 319-85-7
bhc-delta 319-86-8
bhc (lindane)-gamma 58-89-9
bis(chloromethyl)ether 542-88-1
bis(2-chloroethoxy)methane 111-91-1
bis(2-chloroethyl)ether 111-44-4
bis(2-chloroisopropyl)ether 39638-32-9
bis(2-ethylhexyl)phthalate 117-81-7
bromomethane 74-83-9
butyl benzyl phthalate 85-68-7
cadmium 7440-43-9
carbon tetrachloride 56-23-5
chlordane 57-74-9
chlorobenzene 108-90-7
chlorodibromomethane 124-48-1
chloroethane 75-00-3
chloroform 67-66-3
chloromethane 74-87-3
chromium 7440-47-3
chrysene 218-01-9
copper 7440-50-8
cyanide 57-12-5
di-n-butyl phthalate 84-74-2
di-n-octyl phthalate 117-84-0
dibenzo(a,h)anthracene 53-70-3
dichlorobromomethane 75-27-4
dichlorodifluoromethane 75-71-8
dichloromethane 75-09-2
dieldrin 60-57-1
diethyl phthalate 84-66-2
dimethyl phthalate 131-11-3
endosulfan-alpha 959-98-8
endosulfan-beta 33213-65-9
endosulfan sulfate 1031-07-8
endrin 72-20-8
endrin aldehyde 7421-93-4
ethylbenzene 100-41-4
fluoranthene 206-44-0
fluorene 86-73-7
heptachlor 76-44-8

heptachlor epoxide 1024-57-3
hexachlorobenzene 118-74-1
hexachlorobutadiene 87-68-3
hexachlorocyclopentadiene 77-47-4
hexachloroethane 67-72-1
indeno (1,2,3-cd) pyrene 193-39-5
isophorone 78-59-1
lead 7439-92-1
mercury 7439-97-6
n-nitrosodi-n-propylamine 621-64-7
n-nitrosodimethylamine 62-75-9
n-nitrosodiphenylamine 86-30-6
naphthalene 91-20-3
nickel 7440-02-0
nitrobenzene 98-95-3
p-chloro-m-cresol 59-50-7
pcb-1016 (arochlor 1016) 12674-11-2
pcb-1221 (arochlor 1221) 11104-28-2
pcb-1232 (arochlor 1232) 11141-16-5
pcb-1242 (arochlor 1242) 53469-21-9
pcb-1248 (arochlor 1248) 12672-29-6
pcb-1254 (arochlor 1254) 11097-69-1
pcb-1260 (arochlor 1260) 11096-82-5
pentachlorophenol 87-86-5
phenanthrene 85-01-8
phenol 108-95-2
pyrene 129-00-0
selenium 7782-49-2
silver 7440-22-4
tetrachloroethylene 127-18-4
thallium 7440-28-0
toluene 108-88-3
toxaphene 8001-35-2
tribromomethane 75-25-2
trichloroethylene 79-01-6
trichlorofluoromethane 75-69-4
vinyl chloride 75-01-4
zinc 7440-66-6
1,3-dichlorobenzene 541-73-1
1,1-dichloroethane 75-34-3
1,1-dichloroethylene 75-35-4
1,1,1-trichloroethane 71-55-6
1,1,2-trichloroethane 79-00-5
1,1,2,2,-tetrachloroethane 79-34-5
1,2-dichlorobenzene 95-50-1
1,2-dichloroethane 107-06-2
1,2-dichloropropane 78-87-5
1,2-dichloropropylene 563-54-2
1,2-diphenylhydrazine 122-66-7
1,2-trans-dichloroethylene 156-60-5
1,2,4,-trichlorobenzene 120-82-1
1,4-dichlorobenzene 106-46-7

2-chloroethylvinyl ether 110-75-8
2-chloronaphthalene 91-58-7
2-chlorophenol 95-57-8
2-nitrophenol 88-75-5
2,4-dichlorophenol 120-83-2
2,4-dimethylphenol 105-67-9
2,4-dinitrophenol 51-28-5
2,4-dinitrotoluene 121-14-2
2,4,6-trichlorophenol 88-06-2
2,4,7,8-tetrachlorodibenzo-p-dioxin (tcdd) 1764-01-6
2,6-dinitrotoluene 606-20-2
3,3'-dichlorobenzidine 91-94-1
3,4-benzofluoranthene 205-99-2
4-bromophenyl phenyl ether 101-55-3
4-chlorophenyl phenyl ether 7005-72-3
4-nitrophenol 100-02-7
4,4'-ddd(p,p'tde) 75-54-8
4,4'-dde(p,p'ddx) 72-55-9
4,4'-ddt 50-29-3
4,6-dinitro-o-cresol 534-52-1
acidity
alkalinity
dissolved oxygen
dissolved solids
fecal coliform
nitrogen 7727-37-9
oil and grease
oxygen demand
ph
phosphorus 7723-14-0
suspended solids

(6) National Pollutant Discharge Elimination System (NPDES) Permit Compliance

Acronym: NPDES
Media sampled to generate data: Effluents industrial and municipal
Surface after receiving
Type of data collection/monitoring: Effluents and receiving stream
Database status: Operational/ongoing

ABSTRACT: Data from compliance inspections of discharging facilities comprise the NPDES database.

Nonpollutant parameters included:
Chemical data
Collection method
Flow rates
Inspection data
Location
Manufacturer
Physical data
Political subdivisions
Production levels
Sampling date
Site description
Temperature
Treatment devices
Volume/mass measures

Ongoing study time period is 09/01/74 to 09/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: as needed

Total estimated number of observations is 12000.
Estimated annual increase in observations is 2000.

Database includes: Raw data/observations

Total number of stations or sources covered is 600.
Number currently contributing data is not available.
Number of facilities covered is 150.

Geographic coverage of database: Selected federal region: Region III
Location identifiers of station/source for each record are:
State
City
Town/township
Street address
Project identifier

Facility identifiers include:
Plant facility name
Plant location
NPDES

Pollutant identification data have: Storet parameter codes

Limitations: Parameters vary from site to site. Frequency is irregular and depends on program needs of Enforcement Division.

Data collection and analysis procedures: Collection method documented
Analysis method documented
QA procedures documented
Lab analysis based on EPA-approved or accepted methods.
Lab audit is satisfactory.
Precision and accuracy estimates exist but are not included in database
Edit procedures used and documented.

Data collected by: Regional office - Central Regional Lab Annapolis; Surveillance and Analysis Division Region III.
Data analyzed by: Regional office - Central Regional Lab Annapolis; Surveillance and Analysis Division Region III.
Database identifies specific laboratory performing analysis.

Compliance or enforcement is the primary purpose for data collection.
Statutory authorization is P L 92-500 as amended, Sections 308 and 402 (Clean Water Act-CWA)
Form of available reports and outputs: Facility Inspection Reports
Current regular users of databases: 157
Users: EPA regional offices
States
permittees
Confidentiality: No limits on access to data
Primary physical location of data: EPA lab
Form of data storage: Original form (hard copy readings)
Data access: Manually

Contact - Subject matter: Orterio Villa, Jr. (301) 224-2740
Contact - Computer-related: Not applicable
Contact - Responsible EPA office: Central Regional Lab - Region III
Charge for Non-EPA use: No
Frequency of master file update: As requested by Enforcement Division
Related non-EPA databases: State and Permittee Databases
Other pertinent databases: State and Permitter effluent data

Person completing form: Dan Donnelly
Office: EPA/Region III/Central Regional Lab-Annapolis
Address: 839 Bestgage Road, Annapolis, MD 21401
Phone: (301) 224-2740

Pollutant tests included in database:
acidity
alkalinity
dissolved oxygen
dissolved solids
fecal coliform
nitrogen 7727-37-9

Oil and grease
oxygen demand
ph
phosphorus 7723-14-0
suspended solids
phenols
cyanides
sulfur and compounds
fluoride
arsenic 7440-38-2
beryllium 7440-41-7
cadmium 7440-43-9
chromium 7440-47-3
copper 7440-50-8
iron 7439-89-6
lead 7439-92-1
mercury 7439-97-6
nickel 7440-02-0
titanium 7440-32-6
vanadium 7440-62-2
chlorine 7782-50-5
benzene 71-43-2
ammonia 7664-41-7
nitrate 14797-55-8
sulfates
sulfides

(7) Nationwide Urban Runoff Program

Acronym: NURP
Media sampled to generate data: Atmospheric deposition
Ground water
Runoff urban
Sediment
Surface water river, lake, impoundment
Other deposition on street surface
Type of data collection/ monitoring: Nonpoint source data collection
Database status: Operational/ongoing

ABSTRACT: This database contains data taken during storm events. The data is taken in receiving waters, control structures, wetfall/dryfall deposition stations, precipitation stations and in storm sewers. Storm water pollution control technologies can be evaluated from the data. For example, catchments are swept for a time period and data taken; then catchments remain unswept for a time, and data taken in order to evaluate street sweeping. See our quarterly reports for latest results.

Nonpollutant parameters include: Biological data
Chemical data
Collection method
Concentration measures
Cost/economic data
Flow rates
Location
Physical data
Political subdivisions
Population demographics
Polulation density
Precipitation
Salinity
Sampling date
Site description
Temperature
Test/analysis method
Treatment devices
Volume/mass measures
Hydrograph limb: base, rising, peak, falling
Quality of rain

Ongoing study time period is 12/01/78 to 07/30/80 (present)
Termination of data collection: Anticipated 01/30/83

Frequency of data collection: Less than hourly flow and precipitation
Daily: receiving water
Varies with parameter codes related to storm events

Total actual number of observations is 13516.
Estimated annual increase of observations is 3,000,000 (includes flow and precipitation).

Database includes: Raw data/observations

Total number of stations or sources covered is 38.
Number currently contributing data is 38.

Geographic coverage of database: National
Location identifiers of station/source for each record are: State
Cong. district
City
Town/township
Coordinates
Lat./long.

Facility identifiers include: Not applicable
Pollutant identification data have: Storet parameter codes

Limitations: Primarily data related to urban storm water events. Pollutant parameter codes vary by sample.

Data collection and analysis procedures: Sampling plan documented
Collection method documented
Analysis method documented
QA procedures documented
Lab analysis based on EPA-approved or accepted methods.
Lab audit is satisfactory.
Precision and accuracy estimates exist but are not included in database.
No known edit procedures exist.

Data collected by: Local agency - thirty 208 Agencies
State agency - some states (role varies by 208 Agency role)
Contractor - to 208 Agency
Other federal agency - U.S. Geological Survey, Tennessee Valley Authority
Data analyzed by: Local agency - thirty 208 Agencies
EPA lab - providing standards
Contractor Woodward/Clyde
Other federal agency - U.S. Geological Survey, Tennessee Valley Authority
EPA headquarters - Water Planning Division
Database does not identify specific laboratory performing analysis.

Planning is the primary purpose for data collection.
Technology development is the secondary purpose for data collection.
Risk assessment is the secondary purpose for data collection.
Statutory authorization is P L 92-500 as amended, Section 208 (Clean Water Act - CWA)
Form of available reports and outputs: Publications Quarterly Progress Report; Nationwide Urban Runoff Program (write EPA mail code WH-554)

Printout on request
Machine-readable raw data

Current regular users of database: 50
Users: EPA headquarter offices - Office of Water Program Operations/Water Planning Division
Other federal agencies
Confidentiality: No limits on access to data
Primary physical location of data: Headquarters office
Form of data storage: Magnetic disc
Data access: EPA software STORET MIDSD system number: 5303000101
EPA hardware IBM 3032; IBM 370/168 model 1

Contact - Subject matter: Dennis Athayde (202) 755-2114
Contact - Computer-related: Philip Graham (202) 755-2114
Contact - responsible EPA Office: Merna Hurd (202) 755-6928

Charge for non-EPA use: yes
Frequency of master file update: Monthly

Related EPA systems: STORET (Storage and Retrieval of Water Quality Data)

Person completing form: Philip Graham
Office: EPA/(OWWM)/(OWPO)/(WPD)
Address: 401 M St., SW, Washington, DC 20460
Phone: (202) 755-2114

(8) National Water Quality Surveillance System

Acronym: NWQSS
Media sampled to generate data: Surface water fresh water
Type of data collection/monitoring: Ambient data collection
Database status: Operational/ongoing

ABSTRACT: These EPA-designated ambient water quality monitoring stations augment the 1,000 "core" stations operated by the states. Stations are selected by the Regions and operated by the U.S. Geological Survey.

Nonpollutant parameters include:
- Flow rates
- Geographic subdivision
- Salinity
- Sampling date
- Site description
- Temperature

Ongoing study time period is 10/01/79 to 10/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: monthly

Total estimated number of observations is 9000.
Estimated annual increase of observations is 10,800

Database includes: Raw data/observations

Total number of stations or sources covered is 53.
Number currently contributing data is 41.

Geographic coverage of database: National
Location identifiers of station/source for each record are:
- State
- County
- City
- Town/township
- Cooridinates
- Lat./long.
- Agency code
- Station number

Facility identifiers include: Not applicable
Pollutant identification data have: Storet parameter codes

Limitations: None

Data collection and analysis procedures:
- Sampling plan documented
- Collection method documented
- Analysis method documented
- QA procedures documented

Lab analysis based on EPA-approved or accepted methods.

Lab audit is satisfactory for U.S. Geological Protocols-cooperate with EPA.
Precision and accuracy estimates exist but are not included in database
Edit procedures used and documented.

Data collected by: Other federal agency - U.S. Geological Survey
Data analyzed by: Other federal agency - U.S. Geological Survey
Database identifies specific laboratory performing analysis.

Trend assessment is the primary purpose for data collection.
Statutory authorization is P L 95-217, Section 104(2)(5)
Form of available reports and outputs: Publications National Water Quality Inventory/Report to Congress
Unpublished reports December 1 Report to the Administrator
Printouts on request
Machine-readable raw data
On-line computer
included in Council on Environmental Quality Report

Current regular users of database: 1200
Users: EPA headquarter offices - Office of Water Regulations and Standards, Office of Water Program Operations, Office of Pesticides and Toxic Substances
EPA regional offices
EPA laboratories
Other federal agencies
States
Confidentiality: No limits on access to data
Primary physical location of data: Headquarters office
Form of data storage: Magnetic disc
Data access: EPA software STORET MIDSD system number: 5303000101
EPA hardware IBM 370/168

Contact - Subject matter: Reg. Basic Water Monitoring Program Coordinator
Contact - Computer-related: Sam Conger (202) 426-7792
Contact - responsible EPA Office: Regional Basic Water Monitoring Program Coordinator
Charge for non-EPA use: no
Frequency of master file update: Weekly

Related EPA databases: Basic Water Monitoring Program "core" stations
Related non-EPA databases: U.S. Geological Survey National Stream Quality Network; State Systems

Person completing form: Morris L. Mabbitt
Office: EPA/(OWWM)/(OWRS)/(MDSD)
Address: 401 M St., SW, Washington, DC, 20460
Phone: (202) 426-7778

Pollutant tests included in database
dissolved oxygen
fecal coliform
nitrogen 7727-37-9

oxygen demand
ph
phosphorus 7723-14-0
suspended solids
specific conductivity
total organic carbon (TOC)
transparency
aldrin 309-00-2
arsenic 7440-38-2
cadmium 7440-43-9
chlordane 57-74-9
chromium 7440-47-3
copper 7440-50-8
dieldrin 60-57-1
endrin 72-20-8
hexachlorobenzene 118-74-1
lead 7439-92-1
mercury 7439-97-6
pcb-1016 (arochlor 1016) 12674-11-2
pcb-1221 (arochlor 1221) 11104-28-2
pcb-1232 (arochlor 1232) 11141-16-5
pcb-1242 (arochlor 1242) 53469-21-9
pcb-1243 (arochlor 1248) 12672-29-6
pcb-1254 (arochlor 1254) 11097-69-1
pcb-1260 (arochlor 1260) 11096-82-5
pentachlorophenol 87-86-5
4,4-ddd(p,p'tde) 75-54-8
4,4-dde(p,p'-ddx) 72-55-9
4,4'-ddt 50-29-3
hexachlorocyclohexane 58-89-9
methoxychlor 72-43-5
nitrates/nitrites

(9) Surface Impoundment Assessment Information System

Acronym: SIAIS
Media sampled to generate data: Groundwater
Solid Waste
Type of data collection/monitoring: Point source data collection surface impoundments
Data base status: Update terminated

Abstract: The purpose of the Surface Impoundment Assessment (SIA) is to obtain national data on the number, location, and construction of impoundments in existence, to evaluate the pollution potential of a representative random sample of these impoundments based upon hydrogeologic criteria, to obtain information on existing State legislation/regulations and existing programs, to seek information on monitoring activities, to compile data on groundwater pollution cases and to solicit State recommendations for a groundwater program designed to protect the Nation's groundwater from contamination from surface impoundments. No pollutant parameter codes--instead, "waste hazard potentials" are given on a scale of 1 to 10.

Non-pollutant parameters include: Discharge points
Flow rates
Geographic subdivision
Health effects
Industry
Location
Manufacturer
Political subdivisions
Site description
Volume/mass measures
Hydrogeologic characteristics
Distance to drinking water source
Liner information

Ongoing study time period is 01/01/78 to 6/30/80
Termination of data collection: Occurred 06/30/80

Frequency of data collection: one time only

Total actual number of observations is 34,000 sites.

Data base includes: Reference data/citations

Total number of stations or sources covered is 34,000 impoundments.
Number currently contributing data is 34,000
Number of facilities covered is 34,000

Geographic coverage of data base: National
Location identifiers of station/source for each record are: State
County

City
Town/township
Street address
Coordinates
Latitude/Longitude
Project identifier

Facility identifiers include: Plant facility name
Plant location
Parent corporation name
Parent corporation location
Street address
SIC code
Dun and Bradstreet number
NPDES

Limitations: All data were researched by state from existing information records. Represents universe of 80,000 sites. Analysis method and quality assurance procedures not applicable.

Data collection and analysis procedures: Sampling data documented
Collection method documented
Lab analysis not based on EPA-approved or accepted methods.
Lab audit: Data not based on lab analysis.
Precision and accuracy estimates are not available
Edit procedures used and documented.

Data collected by: State agency - EPA type agencies in 47 states
Contractor - in 3 states
Data analyzed by: State agency - 47 states
EPA headquarters - Office of Drinking Water
Data base does not identify specific laboratory performing analysis.

Development of regulations or standards is the primary purpose for data collection.
Program evaluation is the secondary purpose for data collection.
Statutory authorization is P L 93-523, Section 1442(b)(3)(c) (Safe Drinking Water Act-SDWA)
OMB form number: 158-S-78004
Form of available reports and outputs: Printouts on request
Machine-readable raw data
On-line computer
Current regular users of data: five
Users: EPA headquarter offices - Office of Drinking Water
EPA Regional Offices
States
Confidentiality: No limits on access to data
Primary physical location of data: NCC/IBM
Form of data storage: Magnetic disc
Data access: Commercial software SYSTEM 2000
EPA software SIAIS
EPA hardware IBM370/3032
Contact: Subject Matter: Thom Belk (202) 426-3934

Contact - Computer-related: Larry Wiener (202) 426-9805
Contact - Responsible EPA Office: Vic Kimm (202) 426-8847

Charge for non-EPA use: no outside use/access permitted
Frequency of master file update: data collection terminated

Person completed form: Larry Wiener
Office: EPA/(OWWM)/(ODW)
Address: 401 M St., SW Washington, D.C. 20460
Phone: (202) 426-9805

DF:09/17/80

(10) Water Quality Information System

Acronym: STORET

Media sampled to generate data:
- Atmospheric deposition
- Blood
- Drinking water
- Effluents municipal and industrial
- Groundwater
- Runoff all types
- Sediment
- Soil
- Solid waste
- Surface water all types
- Tissue fish and some others

Type of data collection/monitoring: all types of data collection and station descriptions

Data base status: Operational/ongoing

Abstract: Computerized database for storing and retrieving parameteric data pertaining to the quality of U.S. waterways. Contains numerous sub-files including geographic and descriptive station data, physical and chemical water, fish tissue and sediment parametric data, stream flow data, and municipal waste source and disposal data. Collects data from, and provides data to, multiple federal, state and local users. Software includes statistical analysis and graphic capabilities.

Nonpollutant parameters include:
- Biological data
- Chemical data
- Collection method
- Compliance data
- Concentration measures
- Discharge points
- Disposal
- Exposure data
- Flow rates
- Geographic subdivision
- Health effects
- Industry
- Inspection data
- Location
- Physical data
- Political subdivisions
- Precipitation
- Salinity
- Sampling date
- Site description
- Temperature
- Test/analysis method
- Treatment devices
- Volume/mass measures
- Wind direction

WIND VELOCITY

Ongoing study time period is 01/01/00 to 09/30/80 (present) (80-90% of data collected since 1960)
Termination of data collection: Not anticipated

Frequency of data collection:
- one time only
- less than hourly (minute)
- hourly
- daily
- Weekly
- Monthly
- quarterly
- semiannually
- annually
- as needed

Total actual number of observations is 67,000,000
Estimated annual increase of observations is 12,000,000

Data base includes:
- Raw data/observations
- Summary or aggregate observations

Total number of stations or sources covered is 680,000
Number currently contributing data is 300,000
Number of facilities covered is 60,000

Geographic coverage of data base: National
Location identifiers of station/source for each record are:
- State
- County
- SMSA
- Coordinates
- Lat./long.

Facility identifiers include:
- Plant facility name
- Plant location
- Parent corporation name
- Street address
- SIC code
- Dun and Bradstreet number
- NPDES
- Street address: some
- DUN: partial
- NPDES: partial

Pollutant identification data have:
- Storet parameter codes
- CAS registry number codes

Limitations: location and data are highly variable in coverage and frequency. Sampling plan and quality assurance procedures vary by originator of data.

Data collection and analysis procedures: documented in quality assurance project plan
Lab analysis based on EPA-approved or accepted methods.

Lab audit is satisfactory for 20%.
Precision and accuracy estimates partially exist for variable,
less than 5% have precision accuracy stored in STORET.
Edit procedures used and documented.

Data collected by: Self reporting
Local agency - Lakes Region 208 Planning Commission
Local agency - City of Minneapolis-St. Paul
Local agency - Montgomery County Department of Environmental Resources
Local Agency - Fairfax County Government-Lower Potomac Treatment plant
Local agency - Allegheny County Health Department
Local agency - Prince Georges County Health Department
Local agency - City of Philadelphia Water Department
Local agency - 208 Agency, Atlanta
Local agency - West Alabama Planning and Land Development Council
Local agency - Northeast Illinois Planning Commission
Local agency - City of Chicago Metro Sanitary District
Local agency - City of Cleveland
Local agency - Denver Region Council of Governments
Local agency - Pueblo Region Planning Commission
Local agency - Boulder City-County
Local agency - Pikes Peak Area of Government
Local agency - LA County Flood Control District
Local agency - Orange County Health Department
Local agency - Orange County Flood Control
State agency - Department of Water Resources
State agency - Health Departments
State agency - Department of Inland Fisheries and Wildlife
State agency - Department of Human Services
State agency - Water Supply and Pollution Control Commission
State agency - Department of Natural Resources
State agency - Office of Surface Mining
State agency - Department of Health and Environmental Control
State agency - Department of Public Health
State agency - Air and Water Pollution Control Commission
State agency - Department of Parks and Wildlife
State agency - Department of Agriculture in the states of Vermont, Maine, New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, West Virginia, Virginia, Maryland, Delaware, Alabama, Kentucky, Tennessee, Georgia, South Carolina, North Carolina, Mississippi, Florida, Illinois, Minnesota, Wisconsin, Indiana, Ohio, Michigan, Arkansas, Texas, Louisana, Oklahoma, New Mexico, Nebraska, Missouri, Kansas, Iowa, Colorado, South Dakota, Montana, Utah, Wyoming, North Dakota, Nevada, California, Arizona, Washington, Idaho, Oregon, Alaska, Regional Office - I, II, III, IV, V, VI, VII, VIII, IX, X.
Dept. of Environmental Conservation
Delaware River Basin Commission
Water Control Board

EPA lab - Environmental Research Laboratory-Narragansette, RI
EPA lab - Environmental Research Laboratory-Athens, GA
EPA lab - Environmental Research Laboratory-Gulf Breeze, FL
EPA lab - Environmental Research Laboratory-Duluth, MN-Grosse Isle, MI
EPA lab - Environmental Monitoring Systems Laboratory - Las Vegas, NV
Contractor lab
Contractor - universities
Contractor - ADL and other companies
Other federal agency - National Oceanic and Atmospheric Administration (NOAA)
Other federal agency - U.S. Corps of Engineers
Other federal agency - U.S. Geological Survey (USGS)
Other federal agency - Federal Highway Administration
Other federal agency - Tennessee Valley Authority (TVA)
Other federal agency - US Department of Health and Human Services (HHS)
Other federal agency - U.S. Air Force (USAF)
Other federal agency - U.S. Department of Agriculture (USDA)
Other federal agency - U.S. Bureau of Reclamation
Other federal agency - U.S. Department of the Army
Other federal agency - U.S. Forest Service
EPA Headquarters - Office of Enforcement/National Enforcement Investigation Center (NEIC)
EPA headquarters - Office of Water and Waste Management/monitoring and Data Support Division
EPA headquarters - Office of Water and Waste Management/Effluent Guidelines Division

Data analyzed by: Self reporting
Local agency - Lakes Region 208 Planning Commission
Local agency - City of Minneapolis-St. Paul
Local agency - Montgomery County Department of Environmental Resources
Local agency - Fairfax County Government - Local Potomac Treatment Plant
Local agency - Allegheny County Health Department
Local agency - Prince Georges County Health Department
Local agency - City of Philadelphia Water Department
Local agency - 208 Agency, Atlanta
Local agency - West Alabama Planning and Land Development Council
Local agency - Northeast Illinois Planning Commission
Local agency - City of Chicago Metro Sanitary District
Local agency - City of Cleveland
Local agency - Denver Region Council of Governments
Local agency - Pueblo Region Planning Commission
Local agency - Boulder City-County
Local agency - Pike's Peak Area of Government
Local agency - LA County Flood Control District
Local agency - Orange County Health Department
Local agency - Orange County Flood Control

State agency - Department of Water Resources
State agency - Health Departments
State agency - Department of Inland Fisheries and Wildlife
State agency - Department of Human Services
State agency - Water Supply and Pollution Control Commission
State agency - Department of Environmental Conservation
State agency - Delaware River Basin Commission
State agency - Water Control Board
State agency - Department of Natural Resources
State agency - Office of Surface Mining
State agency - Department of Health and Environmental Control
State agency - Department of Public Health
State agency - Air and Water Pollution Control Commission
State agency - Department of Parks and Wildlife
State agency - Department of Agriculture in the states of Vermont, Maine, New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, West Virginia, Virginia, Maryland, Delaware, Alabama, Kentucky, Tennessee, Georgia, South Carolina, North Carolina, Mississippi, Florida, Illinois, Minnesota, Wisconsin, Indiana, Ohio, Michigan, Arkansas, Texas, Louisanna, Oklahoma, New Mexico, Nebraska, Missouri, Kansas, Iowa, Colorado, South Dakota, Montana, Utah, Wyoming, North Dakota, Nevada, California, Arizona, Washington, Idaho, Oregon, Alaska, Regional office - I, II, III, IV, V, VI, VII, VIII, IX, X
EPA lab - Environmental Research Laboratory - Narragansette, RI
EPA lab - Environmental Research Laboratory - Athens, GA
EPA lab - Environmental Research Laboratory - Gulf Breeze, FL
EPA lab - Environmental Reserach Laboratory - Duluth, MN-Grosse Isle, MI
EPA lab - Environmental Monitoring Systems Laboratory - Las Vegas, NV
Contractor lab
Contractor - universities
Contractor - ADL and other companies
Other federal agencies - National Oceanic and Atmospheric Administration (NOAA)
Other federal agency - U.S. Corps of Engineers
Other federal agency - U.S. Geological Survey (USGS)
Other federal agency - Federal Highway Administration
Other federal agency - Tennessee Valley Authority (TWA)
Other federal agency - U.S. Department of Health and Human Services (HHS)
Other federal agency - U.S. Air Force (USAF)
Other federal agency - U.S. Department of Agriculture (USDA)
Other federal agency - U.S. Bureau of Reclamation
Other federal agency - U.S. Department of the Army
Other federal agency - U.S. Forest Service
Database identifies specific laboratory performing analysis.

Trend assessment is the primary purpose for data collection.
Development of regulations or standards is the primary purpose for data collection.
Special study is the primary purpose for data collection.

Compliance or enforcement is the secondary purpose for data collection.
Technology development is the secondary purpose for data collection.
Risk assessment is the secondary purpose for data collection.
Anticipatory/research is the secondary purpose for data collection.
Program evaluation is the secondary purpose for data collection.
Statutory authorization is P L 84-660 (Federal Water Pollution Control Act of 1965 - FWPCA); P L 92-500 as amended (Clean Water Act - CWA)
Form of available reports and outputs: Printouts on request
Microfilm
Machine-readable raw data
On-line computer
Current regular users of data base: 875
Users: EPA Headquarter Offices - Office of Water and Waste Management, Office of Research and Development, Office of Planning and Management, Office of Enforcement, Office of Pesticides and Toxic Substances.
EPA regional offices
EPA laboratories
Other federal agencies
States
Confidentiality: Limits on access within EPA and outside agency for some data
Primary physical location of data: NCC/IBM
Form of data storage: magnetic disc
Data access: EPA software STORET (Storage Retrieval of Water Quality Data)
MIDSD system number: 5303000101
EPA hardware IBM 370/168

Contact- subject matter: Charles S. Conger (202) 426-7792
Contact - Computer-related: Charles S. Conger (202) 426-7792
Contact - responsible EPA Office: Monitoring and Data Support Division (202) 426-7764
Charge for non-EPA use: yes
Frequency of master file update: Weekly

Related EPA systems: Regional and state and U.S. Geological Survey systems; Reach File (locator, site file)
Related EPA data bases: Regional and state, U.S. Geological Survey, United States Forest Service data bases; Basic Water Monitoring Core Stations (D 5303 0001 02); Industrial Facilities Discharge (IFD) File, (D 5303 0001 05); National Water Quality Surveillance System (NWQSS) (D 5303 0001 03); Fish Kills (D 5303 0001 06); Toxic Pollutants in Influents (D 5303 0001 04)

Person completing form: Charles S. Conger
Office: EPA/(OWWM)/(OWRS)/(MDSD)
Address: 401 M Street, SW, Washington, DC, 20460
Phone: (202) 426-7792

(11) Distribution Register of Organic Pollutants in Water

Acronym: WDROP
Media Sampled to generate data: Drinking water
Effluents Industrial and Municipal (treated and untreated)
Groundwater
Surface water rivers, lakes and canals
Type of data collection/monitoring: All types of data collection reported in source documents
Data base status: Operational/ongoing

Abstract: Water DROP contains information about organic compounds that have been identified as water pollutants, as reported in the open scientific literature, EPA research reports, and laboratory reports. When available, data elements are: chemical name(s), Chemical abstracts Service Registry Number, molecular weight, molecular formula, sampling site, date and technique, analytical method, concentration, analytical laboratory, data source document, and data reliability index. Data can be retrieved from the computerized database by using any one or combinations of these data elements.

Nonpollutant parameters include: Chemical data
Collection method
Concentration measures
Location
Sampling date
Test/analysis method
Document used as data source
Reliability index
Name of laboratory that analyzed sample

Ongoing study time period is 01/01/61 to 12/30/79 (present)
Termination of data collection: Not anticipated

Frequency of data collection: As new information becomes available

Total actual number of observations is 10,500
Estimated annual increase of observations depends on future funding

Data base includes: Data/observations
Summary or aggregate observations

Geographic coverage of data base: International
Location identifiers of station/source for each record are: State
City
Town/Township

Facility identifiers include: Plant location
Pollutant identification data have: CAS registry number codes

5. ALPHABETICAL LISTING OF SELECTED AIR DATABASES

a. Index of Selected Air Databases

(1) BACTLEAR
(2) NEDS
(3) SAROAD
(4) SOTDAT

(1) BACT/LAER Determination

Acronym: BACTLAER
Media sampled to generate data: Air
Emissions any major sources
Type of data collection/monitoring: Point source data collection any major emitting source
Data base source: Operational/ongoing

Abstract: The database contains selected parameter codes in summary form, from actual issued new source permits. The parameters consist of pollutants emitted, both types and amounts, control technology and efficiencies, and location of person making determination. As states submit new determinations, they will be entered into the system.

Nonpollutant parameters include: Industry
Manufacturer
Political subdivisions
Production levels
Site description
Control devices
Control efficiencies

Ongoing study time period is 12/01/77 to 03/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: annually
Other. As new determinations are made and submitted, they would be entered into the system.
8

Total estimated number of observations is 280.
Estimated annual increase of observations is 100.

Database includes: reference data/citations
projected engineering evaluations

Total number of stations or sources covered is 280.
Number currently contributing data is 280.
Number of facilities covered is 280.

Geographic coverage of database: National
Location identifiers of station/source for each record are: State
City
Coordinates/UTM

Facility identifiers include: Plant facility name
Plant location
Parent corporation name
Parent corporation location
Street address
SIC code

Dun and Bradstreet number

Pollutant identification data are: Uncoded

Limitations: The limits presented were those for a given source at a given time and location, and should be used as a guide in making the case-by-case determination required by law.

Data collection and analysis procedures: Sampling plan documented
Collection method documented
Analysis method documented

Lab analysis based on EPA-approved or accepted methods.
Lab audit: Data not based on lab analysis.
Precision and accuracy estimates are not available
No known edit procedures exist.

Data collected by: State agency - most state agencies
Regional office - all regional offices
Contractor - Pedco Environmental, Inc.

Data analyzed by: Local agency - various local agencies
State agency - most state agencies
Regional office - all regional offices
EPA headquarters - Office of Air Quality Planning and Standards

Database does not identify specific laboratory performing analysis.

Technology development is the primary purpose for data collection.
Trend assessment is the secondary purpose for data collection.
Statutory authorization is P L 95-95 Parts C&D (Clean Air Act Amend. of 1977)

Form of available reports and outputs: Publications Compilation of BACT/LAER Determinations, EPA 450/2-79-003
Compilation of BACT/LAER Determinations, revised EPA 450/2-79-003

Current regular users of database: 200

Users: EPA headquarter offices - Office of Air Quality Planning and Standards; Stationary Source Enforcement Division
EPA regional offices
Other federal agencies
States
Industry

Confidentiality: Limits on outside access for some data

Primary physical location of data: NCC/UNIVAC
Headquarters office
emissions data on Univac, actual determinations are in hardcopy form

Form of data storage: Original form (hardcopy, readings)
Data access: Manually

Contract - Subject matter: Gary Rust (919) 541-5291
Contact - Computer-related: Not applicable
Contact - responsible EPA office: Office of Air Quality Planning and Standards (919) 541-5291

Charge for non-EPA use: no
Frequency of master file update: Annually

Related EPA databases: National Emissions Data System (NEDS)
Other pertinent databases: all State Air Permit Programs

Person completing form: Gary Rust
Office: EPA/(OANR)/(OAQPS)/(CPDD)
Address: Research Triangle Park NC 27711
Phone: (919) 541-5291

Pollutants included in database:
acid mist
fluorides
total reduced sulpnur
carbon monoxide 630-08-0
hydrocarbons
lead 7439-92-1
nitrogen dioxide 10102-44-0
ozone 10028-15-6
sulfur dioxide 7446-09-5
total suspended particulates
asbestos 1332-21-4
benzene 71-43-2
beryllium 7440-41-7
mercury 7439-97-6
vinyl chloride 75-01-4

(2) National Emission Database

Acronym: NEDS
Media sampled to generate data: Emissions Point source and area source
Type of data collection/monitoring: Point source data collection any point or area emitter
Database status: Operational/ongoing

Abstract: The National Emissions database contains data describing the annual emissions and operating characteristics of all point and area emitters in the United States. All states are required by regulation to submit this data on an annual basis to the Regional Offices. The data are then transmitted to the National Air Data Branch of OAQPS where it is processed.

Nonpollutant parameters include:
- Compliance data
- Discharge points
- Flow rates
- Location
- Manufacturer
- Political subdivisions
- Production levels
- Temperature
- Treatment devices
- Stack parameter codes
- Operating schedule
- Percent of annual thruput
- Design rates
- Full characteristics

Ongoing study time period is 01/01/72 to 11/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: as needed

Total estimated number of observations is 265,000
Estimated annual increase of observations is 40,000

Database includes: Raw data/observations

Total number of stations or sources covered is 55,900
Number currently contributing data is 55,900
Number of facilities covered is 55,900

Geographic coverage of database: National
Location identifiers of station/source for each record are:
- State
- County
- City
- Street address
- Coordinates UTM

Facility identifiers include: Plant facility name
Plant location
Street address
SIC code
SCC
Pollutant identification data are: Uncoded

Limitations: Number of sourceswill vary by reporting period depending on volume of emissions during prior year. Quality assurance procedures vary by state.

Lab analysis not based on EPA-approved or accepted methods.
Lab audit: Data not based on lab analysis.
Precision and accuracy estimates are not available.
Edit procedures used and documented.

Data collected by: Local agency - Selected local agencies in some states
State agency - All 54 State/territorial agencies
Data analyzed by: EPA headquarters - National Air Data Branch, OAQPS
Database does not identify specific laboratory performing analysis.

Development of regulations or standards is the secondary purpose for data collection.
Technology development is the secondary purpose for data collection.
Technology evaluation is the primary purpose for data collection.
Statutory authorization is PL 88-206 as amended (Clean air Act CAA)
OMB form number: 158-R-0095
Form of available reports and outputs: Printouts on request
Current regular users of database: 20
Users: EPA headquarter offices - OAQPS
EPA regional offices
Contractors
Universities
Confidentiality: No limits on access data
Primary physical location of data: NCC/UNIVAC
Form of data storage: Magnetic disc
Data access: EPA software National Emissions Data System (NEDS) MIDSD system number: 4504000921
EPA hardware UNIVAC 1110/82

Contact - Subject matter: Charles O. Mann (919) 541-5395
Contact - Computer-related: Chuck Isbell (919) 541-5247
Contact - responsible EPA office: Office of Air Quality Planning and Standards (919) 541-5315

Charge for non-EPA use: yes
Frequency of master file update: Monthly

Related EPA systems: Hazardous and Trace Emissions Monitoring Systems (HATREMS MIDSD #4504000921)
Other pertinent databases: State agency emissions inventory data bases

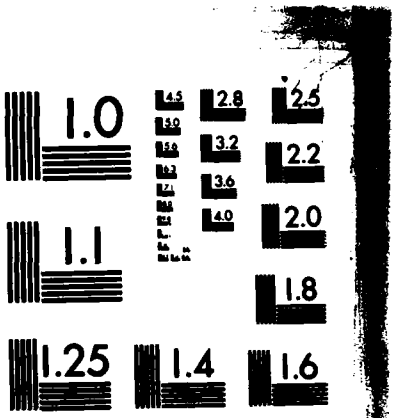
Person completing form: Sue Kimbrough
Office: National Air Data Branch Office of Air Quality

Planning and Standards
Address: RTP, NC 27711
Phone: (919) 541-5395

Pollutants included in database:
carbon monoxide 630-08-0
hydrocarbons
lead 7439-92-1
nitrogen dioxide 10102-44-0
sulfur dioxide 7446-09-5
total suspended particulates
volatile organic compounds

AD-A133 265 FEASIBILITY STUDY FOR AN AIR FORCE ENVIRONMENTAL MODEL AND DATA EXCHANGE..(U) GENERAL SOFTWARE CORP LANDOVER MD S MCKENZIE ET AL. JUL 83 AFESC/ESL-TR-82-13-VOL-4 4/4

UNCLASSIFIED F/G 5/1 NL



(3) Storage and Retrieval of Aerometric Data

Acronym: SAROAD
Media sampled to generate data: Air
Type of data collection/monitoring: Ambient data collection
Database status: Operational/ongoing

Abstract: SAROAD is a system for editing, storing, summarizing, and reporting ambient air quality data. Raw data are collected by State agencies for the criteria pollutants, reported to Regional Offices and submitted for update. The data reporting by States began in 1972-1973. The data are published in summary form, are utilized for trends analysis, and to determine whether National Ambient Air Quality Standards (NAAQS) are being met.

Nonpollutant parameters include:
- Collection method
- Concentration measures
- Elevation
- Location
- Political subdivisions
- Site Description
- Temperature
- Wind direction
- Wind velocity

Ongoing study time period is 01/01/57 to 03/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection:
- hourly
- daily
- weekly

Total estimated numberof observations is 300,000,000
Estimated annual increase of observations is 20,000,000

Database includes:
- Raw data/observations
- Summary or aggregate observations

Total number of stations or sources covered is 14,000
Number currently contributing data is 5,000

Geographic coverage of database: National
Location identifiers of station/source for each record are:
- State
- County
- SMSA
- City
- Street address
- Coordinates UTM

Facility identifiers include: Not applicable

Pollutant identification data have: SAROAD parameter codes

Lab analysis based on EPA-approved or accepted methods.
Lab audit is partially satisfactory.
Precision and accuracy estimates are not available.
Edit procedures used and documented.

Data collected by: Local agency
State agency - all
Regional office - all
EPA lab - Environmental Monitoring Systems Lab Research, Triangle Park, NC
Other federal agency - Tennessee Valley Authority, EPA headquarters
Data analyzed by: Local agency
State agency - all
Regional office - all
Other federal agencies - Brookhaven National Laboratory Department of Energy, Tennessee Valley Authority
EPA headquarters
Council on Environmental Quality
Database identifies specific laboratory performing analysis.

Compliance or enforcement is the primary purpose for data collection.
Trend assessment is the primary purpose for data collection.
Statutory authorization is 40 CRF Part 58, Subpart and CAD
OMB form number: 158-R-0012
Form of available reports and outputs: Pub. Air Quality Data-1978 Annual Statistics Including Summaries with Reference to Standards
Printouts on request
Machine-readable raw data
Current regular users of database: 200
Users: EPA headquarter offices - Office of Air Quality Planning and Standards
EPA regional offices
EPA laboratories
Other federal agencies
States
contractors
consultants
Confidentiality: No limits on access to data
Primary physical location of data: NCC/UNIVAC
Form of data storage: Magnetic disc
Data access: EPA software SAROAD MIDSD system number: 4504000918
EPA hardware UNIVAC 1110/82

Contact - Subject matter Jacob G. Summers (919) 541-5491
Contact - Computer-related: Ed Mast (919) 541-5247
Contact - responsibile EPA Office: Harold Barkhau (919) 541-5491

Charge for non-EPA use: yes, Freedom of Information requests only.
Frequency of master file update: Other every 3 weeks

Person completing form: Jacob G. Summers
Office: EPA/(OANR)/(QAQPS)/(MDAD)
Address: Research Triangel Park, NC 27511
Phone: (919) 541-5395

Pollutant tests included in database:
carbon monoxide 630-08-0
hydrocarbons
lead 7439-92-1
nitrogen dioxide 10102-44-0
ozone 10028-15-6
sulfur dioxide 7446-09-5
total suspended particlulates
soil index
zinc 7440-66-6
tin
strontium
total oxidizable carbon
fluoride
chloride
ammonium
sulfate
nitrogen oxides
methane
propane
aldehyde
arsenic 7440-38-2
barium 7440-39-3
beryllium 7440-41-7
cadmium 7440-43-9
chromium 7440-47-3
cobalt 7440-48-4
copper 7440-50-8
iron 7439-89-6
lead 7439-92-1
manganese 7439- 96-5
mercury 7439-97-6
nickel 7440-02-0
selenium 7782-49-2
titanium 7440-32-6
vanadium 7440-62-2
antimony 7440-36-0
barium 7440-39-3
benzo (a)pyrene 50-32-8
bismuth compounds 7440-69-9
carbon disulfide 75-15-0
hydrogen sulfide 7783-06-4
nitrate 14797-55-8
molybdenum and compounds 7439-98-7
sodium 7440-23-5

(4) Source Test Data Systems

Acronym: SOTDAT
Media sampled to generate data: Emissions point source-stack
Type of data collection/monitoring: Point source data collection stack
Database status: Operational/ongoing

Abstract: SOTDAT provides a system for storage, retrieval and analysis of stack test data and related process and engineering information necessary to calculate emission factors. Data are available for test reports from the EPA Emission Measurement Branch and other EPA-sponsored test programs.

Nonpollutant parameters include:
- Collection method
- Concentrations measures
- Flow rates
- Location
- Political subdivisions
- Production levels
- Sampling data
- Test/analysis method
- Treatmen devices
- Volume/mass measures

Ongoing study time period is 01/01/67 to 12/30/77
Termination of data collection: Not anticipated

Frequency of data collection: as needed

Total estimated number of observations is 2500.
Estimated annual increase of observations is 250.

Database includes: Raw data/observations

Total number of stations or sources covered is 500.
Number currently contributing data is 50.
Number of facilities covered is 500.

Geographic coverage of data base: National
Location identifiers of station/source for each record are: Street address
Facility identifiers include:
- Plant facility name
- Plant location
- Street address
- SIC code
- SCC

Pollutant identification data are: Coded with other coding schemes

Limitations: Source test data are for selected facilities during a specific time and not for all sources for a specific industry on a continuing basis.

Lab analysis not based on EPA-approved or accepted methods.

Precision and accuracy estimates are not available.
Edit procedures used and documented

Data collected by: EPA headquarters - Office of Air Quality Planning and Standards
Emission Standards and Engineering Division
EPA headquarters - Office of Air Quality Planning and Standards
Monitoring and Data Analysis Division
Freedom of Information Requests
Database does not identify specific laboratory performing analysis.

Development of regulations or standards is the primary purpose of data collection.
No statutory requirements: The need for data on which to base air quality standards and requlations.
Form of available reports and outputs: Printouts on request
Current regular users of data base: 10
Users: EPA headquarter offices - Office of Air Quality Plan. and Standards
EPA regional offices
Confidentiality: No limits on access to data
Primary physical location of data: NCC/UNIVAC
Form of data storage: Magnetic disc
Data access: EPA software SOTDAT MIDSD system number: 4504000919
EPA hardware UNIVAC 1110/82

Contact - Subject matter: Jacob G. Summers (919) 541-5395
Contact - Computer-related: Jerry Slaymaker (919) 541-5247
Contact - Responsible EPA Office: Harold Barkhau (919) 541-5491

Charge for non-EPA use: yes
Frequency of master file update: Other as needed

Related EPA databases: The identifiers are the same as those utilized by Nationel Emissions Data System.

Person completing form: Jacob G. Summers
Office: EPA/(OANR)/(OAQPS)/(MDAD)
Address: Research Triange Park, NC 27511
Phone: (919) 541-5395

Pollutants included in database:
acid mist
fluorides
nitrogen oxides
carbon monoxide 630-08-0
hydrocarbons
lead 7439-92-1
sulfur dioxide 7446-09-5
total suspended particulates
beryllium 7440-41-7
mercury 7439-97-6
ammonia 7664-41-7

6. ALPHABETICAL LISTING OF OTHER MODEL DATABASES

a. Index of Other Model Databases

(1) CSIN (Chemical)
(2) IFB (Chemical)
(3) State and Local Noise Control Database

(1) Chemical Substances Information Network

Acronym: CSIN
Media sampled to generate data: CSIN to allow access to many kinds of existing resources carrying data and information on all the media.

Type of data collection/monitoring: CSIN to allow access to many databases carrying information for various sources.

Database status: Funded for development Projected operational date: 01/00/81

Abstract: CSIN provides a coordinated approach to the identification, location, accessing, processing, and analysis of data and information on chemical substances and how they impact humans and the environment. The Network will allow and encourage user interaction with data resources which are geographically scattered and resident in disparate and diverse computer systems. Most of the complex interfacing steps previously required to make use of computer resources will be eliminated and/or made transparent to the user.

Nonpollutant parameters include:
Biological data
Chemical data
Collection method
Compliance data
Concentration measures
Cost/ecomonic data
Discharge points
Disposal
Evaluation
Exposure data
Flow rates
Funding data
Geographic subdivision
Health effects
Industry
Inspection data
Location
Manufacturer
Physical data
Political subdivisions
Population demographics
Population density
Precipitation
Production levels
Salinity
Sampling date
Site description
Temperature
Test/analysis method
Treatment devices
Use
Volume/mass measures

Wind direction
Wind velocity
Presence of data elements varies by resource (database)

Ongoing study time period is 01/01/70 to 09/30/80 (present)
Termination of data collection: Not anticipated

Frequency of data collection: frequency of collection, sampling, updating department on rate established by each resource in the network

Total estimated number of observations is 2.5 million
Estimated annual increase of observations is 15-20 million.

Database includes: Raw data/observations
Summary or aggregate observations
Reference data/citations
varies by resource/database

Total number of stations or sources covered is 8-10 resources.
Number currently contributing data is three

Geographic coverage of database: International
National
Location identifiers of station/source for each record are:
State
County
Congressional district
SMSA
City
Town/township
Street address
Coordinates
Project identifier
varies by resource/database
Facility identifiers include: Plant facility name
Plant location
Parent corporation name
Parent corporation location
Street address
SIC code
Dun and Bradstreet number
SCC
NPDES
Program identifier
varies by resource/database
Pollutant identification data have: CAS registry number codes

Limitations: The prototype, operational '81, includes NLM (Medlears Chemiline,etc.) CIS and CICIS, 5-7 additional resources will be added in calendar '81. Each, resource on the network has front end caveats which speak to differences in periods of sampling, numbers of observation, experimental protocols, quality assurance procedures followed and levels of documentation, etc.

Data collection and analysis procedures: documented in quality assurance project plan

Sampling plan documented
Collection method documented
Analysis method documented
A procedures documented (above varies by resource/data base)

Lab analysis based on EPA-approved or accepted methods.
Lab analysis not based on EPA-approved or accepted methods.
(Above varies by resource/database).
Lab audit is satisfactory for varies by database.
Precision and accuracy estimates partially exist for some resource/databases

Edit for some resources, not for others.

Data collected by: Self-reporting
Local agency
State agency
Regional office
EPA lab
Contractor lab
Contractor
Other federal agency
EPA headquarters
Collector varies by resource/database

Data analyzed by: Self-reporting
Local agency
State agency
Regional office
EPA lab
Contractor lab
Contractor
Other federal agency
EPA headquarters
Analyzer varies by resource/database

Database identifies specific laboratory performing analysis.
Database does not identify specific laboratory performing analysis.

Development of regulations or standards is the purpose for data collection.
Compliance or enforcement is the purpose of data collection.
Trend assessment is the purpose for data collection.
Technology development is the purpose for data collection.
Risk assessment is the purpose for data collection.

Anticipatory/research is the purpose for data collection.
Program evaluataion is the purpose for data collection.
Special study is the purpose for data collection.
Purpose varies by resource/data base is the purpose for data collection.
Statutory authorization is P L 94-469, Sections 10 and 25. Each resource has its own authorization.
Form of available reports and outpts: Publications overview documents, technical user documents, CSIN Directory
Unpublished reports
Printouts on request
Microfilm
Machine-readable raw data
On-line computer
Outputs available vary by resource/database
Current regular users of database: 10-50 offices
Users: EPA headquarter offices - Office of Pesticides and Toxic Substance
Office of Toxic Integration
EPA regional offices
EPA laboratories
Other federal agencies
States
Industry, academia, and other nations.
Confidentiality: Limits on access within EPA and outside agency for some data
Primary physical locations of data: Contractor
EPA lab
Regional office
NCC/UNIVAC
NCC/IBM
Headquarters office
State agency
Other federal agency
Varies by resource/data base.
Form of data storage: Magnetic tape
Magnetic disc
Microfiche/film
Original form hard copy(readings)
Varies by resource/data base.
Data access: EPA sofrware MIDSD system number: 7500000901
data identified, located and accessed through the CSIN front end.

Contact - Subject matter: Dr. Sidney Siegal (202) 755-8040
Contact - Computer-relatated: Dr. Sidney Siegal (202)755-8040
Contact - Responsible EPA Office: Office of CSIN Administration
(202) 755-8040

Charge for non-EP. ..: s
Frequency of master ..le update: varies by resource/database.

Related EPA systems: Chemical Information System (CIS), Chemical in Commerce Information System (CICIS)
Related EPA databases: Storage and Retrieval of Water Quality and Related Data(STORET), User-Prompted Graphic Data Evaluation System (UPGRADE), Health and Environmental Effects Data Analysis System (HEEDA)
Related non-EPA databases: National Library of Medicine - bibliographic files (NIM), Toxicology Data Management System (TDMS), Chemical Regulations and Guidelines System (CRGS), PROPHET (National Institutes of Health)

(2) IFB Organic Database

Acronym: None
Media sampled to generate data: Effluents industrial, publicly owned treatment works

Type of data collection/monitoring: Point source data collection industrial, publicly owned treatment works
Database status: Operational/ongoing

Abstract: Database contains the analytical results of 1,627 effluent samples taken in 36 industrial categories between 8/28/78 and 4/15/80.

Nonpollutant parameters include: Collection method
Concentration measures
Industry
Location
Sampling data
Site description

Ongoing study time period is 08//01/78 to 09/30/81 (present)
Termination of data collection: Anticipated 09/30/81

Frequency of data collection: one time only
Other varies by site - may be more than once

Total actual number of observation is 155,710
Estimated annual increase of observations is 1,000

Data base includes: Raw data/observations

Total number of stations or sources covered is 1,500
Number currently contributing data is 0.
Number of facilities covered is 300.

Geographic coverage of database: National
Location identifiers of station/source for each record are: ZIP Code
Facility identifiers include: Plant facility name
Plant location
Pollutant identification data have: Storet parameter codes

Data collection and analysis procedures: Sampling plan documented
Collection method documented
Analysis method documented
QA procedures documentd
Lab analysis based on EPA-approved or accepted methods.
Lab audit is satisfactory
Precision and accuracy estimates exist but are not included in data base.

Edit procedures used and documented.
Data collected by: Regional office - Surveillance and Analysis Division
Contractor - project contractors
Data analyzed by: Regional office - Surveillance and Analysis Division
(small %) Regions I, II, III, IV, V, VII.
Contractor lab - IFB labs
Database identifies specific laboratory performing analysis.

Development of regulations or standards is the primary prupose for data collection.

Statutory authorization is P l 92-500 as amended (Clean Water Act - CWA)
Form of available reports and outputs: Unpublished reports Tabulation of Priority
Pollutants
Printouts on request
Microfilm
Current regular users of database: 4-5
Users: EPA headquarter offices - Office of Analytic Support, Effluent Guidelines Division
Confidentiality: Limits on access within EPA and outside agency for some data.
Primary physical location of data: NCC/IBM
Form of data storage: Magnetic disc
Data access: Commercial Software Statistical Analysis System (SAS)
EPA hardware IBM 370/168

Contact - Subject matter: Dr. M. Dean Neptune (202) 426-7770
Contact - Computer-related: Mike H. Carter (202) 426-7770
Contact - Responsible EPA office: Office of Analytic Support Effluent Guidelines Division (202) 426-7770

Charge for non-EPA use: no outside use/access permitted
Frequency of master file update: Other data currenty complete

Related EPA databases: Effluent Guidelines Division: D5302000108 Pharmaceutical
Screening/Verification Database, D5302000102 Publicly Owned Treatment Works Analytical Data, D5302000112 Paint and Ink Analytical Data

Person completing form: Mike H. Carter
Office: EPA/(OWWM)/(OWRS)/(EGD)
Address: 401 M Street SW Washington, DC 20460
Phone: (202) 426-7770

Pollutants included in database:

acenaphthene 83-32-9	benzo(a) anthracene 56-55-3
acenaphthylene 208-96-8	benzo(a)pyrene 50-32-8
acrolein 107-02-8	benzo(g,g,i)perylene 191-24-2
acrylonitrile 107-13-1	benzo(k)fluoranthene 207-08-9
aldrin 309-00-2	beryllium 7440-41-7

anthracene 120-12-7
antimony 7440-36-0
arsenic 7440-38-2
asbestos 1332-21-4
benzene 71-43-2
benzidine 92-87-5
bhc-alpha 319-84-6
bhc-beta 319-85-7
bhc-delta 319-86-8
bhc(lindane)-gama 58-89-9
bis(chloromethyl)ether542-88-1
bis(2-chloroethoxy)methane 111-91
bis(2-chloroethyl)ether 111-444-4
bis(2-chloroisopropyl)ether 39638-32-9
bis(2-ethylhexyl)phthalate 117-81-7
bromomethane 74-83-9
butyl benzyl phthalate 85-68-7
cadmium 7440-43-9
carbon tetrachloride 56-23-5
chlordane 57-74-9
chlorobenzene 108-90-7
chlorodibromomethane 124-48-1
chloroethane 75-00-3
chloroform 67-66-3
chloromethane 74-87-3
chromium 7440-47-3
chrysene 218-01-9
copper 7440-50-8
cyanide 57-12-5
di-n-butyl phthalate 84-74-2
di-n-octyl phthalate 117-84-0
dibenzo(a,h) anthracene 53-70-3
dichlorobromomethane 75-27-4
dichlorodifluoromethane 75-71-8
dichloromethane 75-09-2
dieldrin 60-57-1
diethyl phthalate 84-66-2
dimethyl phthalate 131-11-3
endosulfan-alpha 959-98-8
endosulfan-beta 33213-65-9
endosulfan sulfate 1031-07-8
endrin 72-20-8
endrin aldehyde 7421-93-4
ethylbenzene 100-41-4
fluoranthene 206-44-0
fluorene 86-73-7
heptachlor 76-44-8
heptachlor epoxide 1024-57-3
hexachlorobenzene 118-74-1
hexachlorobutadiene 87-68-3
hexachlorocyclopentadiene 77-47-4
hexachloroethane 67-72-1
indeno (1,2,3-cd)pyrene 193-39-5
isophorone 78-59-1
lead 7439-92-1
mercury 7439-97-6
n-nitrosodi-n-propylamine 621-64-7
n-nitrosodimethylamine 62-75-9
n-nitrosodiphenylamine 86-30-6
naphthalene 91-20-3
nickel 7440-02-0
nitrobenzene 98-95-3
p-chloro-m-cresol 59-50-7
pcb-1016 (arochlor 1016) 12674-11-2
pcb-1221 (arochlor 1221) 11104-28-2
pcb-1232 (arochlor 1232) 11141-16-6

pcb-1242 (arochlor 1242) 53469-21-9
pcb-1248 (arochlor 1248) 12672-29-6
pcb-1254 (arochlor 1254) 11097-69-1
pcb-1260 (arochlor 1260) 11096-82-6
pentachlorophenol 87-86-5
phenanthrene 85-01-8
Phenol 108-95-2
pyrene 129-00-0
selenium 7782-49-2
silver 7440-22-4
tetrachloroethylene 127-18-4
thallium 7440-28-0
toluene 108-88-3
toxaphene 8001-35-2
tribromomethane 75-25-2
trichloroethylene 79-01-6
trichloroflueromethane 75-69-4
vinyl chloride 75-01-4
zinc 7440-66-6
1,3-dichlorobenzene 541-73-1
1,1-dichloroethane 75-34-3
1,1-dichloroethylene 75-35-4
1,1,1-trichloroethane 71-55-6
1,1,2-trichloroethane 79-00-5
1,1,2,2,-tetrachloroethane 79-34-5
1,2-dichlorobenzene 95-50-1
1,2-dichloroethane 107-06-2
1,2-dichloropropane 78-87-5
1,2-dichloropropylene 563-54-2
1,2-diphenylhydrazine 122-66-7
1,2-trans-dichloroethylene 156-60-5
1,2,4,-trichlorobenzene 120-82-1
1,4-dichlorobenzene 106-46-7
2-chloroethylvinyl ether 110-75-8
2-chloronaphthalene 91-58-7
2-chlorophenol 95-57-8
2-nitrophenol 88-75-5
2,4-dichlorophenol 120-83-2
2,4-dimethylphenol 105-67-9
2,4-dinitrophenol 51-28-5
2,4-dinitrotoluene 121-14-2
2,4,6-trichlorophenol 88-06-2
2,4,7,8-tetrachlorodibenzo-p-dioxin
(tedd) 1764-01-6
2,6-dinitrotoluene 606-20-2
3,3'-dichlorobenzidine 91-94-1
3,4-benzofluoranthene 205-99-2
4-bromophenyl phenyl ether 101-55-3
4-chlorophenyl phenyl ether 7005-72-3
4-nitrophenol 100-02-7
4,4'-ddd(p,p^{1}tde) 75-54-8
4,4'-dde(p,p^1-ddx) 72-55-9
4,4'-ddt 50-29-3
4,6-dinitro-o-cresol 534-52-1

(3) State and Local Noise Control Database

Acronym: None
Media sampled to generate data: Noise
Type of data collection/monitoring: status of state and local noise control programs
Database status: Funded for development. Projected Operational data: 01/00/81

Abstract: The database contains the nature and scope of environmental noise control activities in the nation's municipalties and states (i.e. noise legislation, type of control program, and utility of various types of information on noise related issues).

Non-pollutant parameters include: Compilance data
Cost/economic data
Geographic subdivision
Political subdivision
Population demographic

Ongoing study time period is 01/01.72 to 12/30/80 (present)
Termination of data collection: not anticipated

Frequency of data collection: other 1-3 years

Database includes: program information (subjective and objective)

Geographic coverage of database: National

Location identifiers of station/source for each record are: State, County

Facilitiy identifiers include: Not applicable

Limitations: Data in database is not coded. Data quality assurance is not an issue with this database.

Lab analysis not based on EPA-approved or accepted methods.
Lab audit: Data not based on lab analysis.

Data collected by: Contactor - National League of Cities
Data analyzed by: Contractor - National League of Cities
EPA headquarters - Office of Noise Abatement and Control
Database does not identify specific laboratory performing analysis.

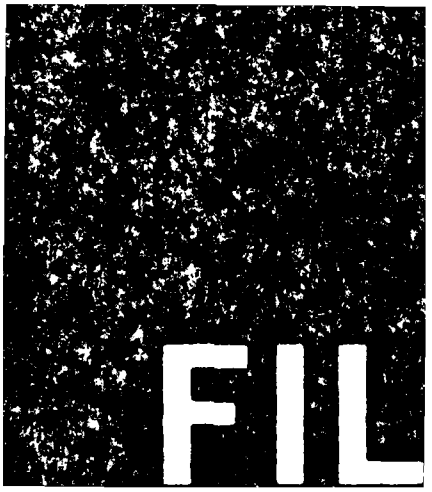
To develop technical assistance packages for states and local agencies is the primary purpose for data collection.
Development of regulations or standards is the secondary purpose for data collection.
Compliance or enforcement is the secondary purpose for data collection.
Trend assessment is the secondary purpose for data collection

Not statutory requirement: data collection requirement is to ascertain level of noise control activities in the states and municipalities
OMB form number: 158-R-0099
Form of availabel reports and outputs: Publication Status of State and Local Noise Control Progam
Current regular users of database: 200
Users: EPA headquarter offices - Office of Noise Abatement and Control
EPA regional offices
States
Confidentiality: No limits on access to data
Primary physical location of data: State agency
Form of data storage: Magnetic tape
Data access: Commercial software Statistical Program for Social Sciences (SPSS)
EPA hardware IBM 370

Contact - Subject matter: Leonard Libster (703) 557-9307
Contact - Computer-related: Leonard Libster (703) 557-9307
Contact - Responsible EPA Office: State and Local Programs Division (703) 557-9307

Charge for non-EPA use: no
Frequency of master file update: Other every 3 years

Person completing form: Leonard Libster
Office: EPA/(OANR)/ONAC)
Address: Crystal Mall #2 Arlington, VA
Phone: (703) 557-9307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